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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

CHICAGO 16, ILLINOIS

GAS ABSTRACTS

JULY, 1958

VOLUME 14 NUMBER 7

AFFILIATED WITH

ILLINOIS INSTITUTE OF TECHNOLOGY

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O. P. BRYSCH, Editor

GAS ABSTRACTS is published and distributed monthly by the Institute of Gas Technology, Chicago 16, Illinois. The contents of selected papers and patents are reviewed impartially by the editorial staff and material of potential interest to the Gas Industry is presented. Subscription rates to non-members of the Institute: $18.00 per year to U.S. addresses; $22.00 foreign—Printed in the U.S.A.

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A microfilm edition of Gas Abstracts can be supplied by University Microfilms, 313 N. First St., Ann Arbor, Michigan.

1. MANAGEMENT

Gas Industry Expansion

Second Half's Construction Outlay by Gas Utilities to Exceed $500 Million. *Gas Age 121,* 15 (1958) June 26.

Survey indicates step-up in budgets from estimates of six months ago; extension and replacement of distribution facilities will account for about 80% of the outlay, storage facilities and production about 10% and general construction the remainder.

Petrochemicals

A Decade of Gain—and Now a Decline. *Oil Gas J. 56,* 58 (1958) June 30 (2 pp.)

U. S. Tariff Commission reports a slowdown in petrochemical gains during the past year. Report says production of synthetic organic chemicals from petroleum and natural gas totaled 18,089,395,000 lb against 17,898,030,000 lb in 1956.

Putting Pinch on U.S. Petrochemical Exports. *Chem. Week 82,* 21 (1958) June 28 (2 pp.)

Exports to Europe, steadily on the upswing since World War II, will probably level off in 1959 as big new German petrochemical plants come onstream. Affected will be benzene, phthalic anhydride, styrene polymers and copolymers, vinyl and vinyl copolymer resins, ethylene glycol and ethyl alcohol.

Drilling

Drilling Future Looks Bright in the Rockies. D. Monroe. *Drilling 19,* 71 (1958) June (2 pp.)

Footage drilled in the first quarter of 1958 is 1,056,073 ahead of the comparable period in 1957. Wells are going deeper; dual completions are increasing.

Rigs Have Another Busy Year Abroad. *Oil Gas J. 56,* 68 (1958) July 14 (2 pp.)

Survey indicates that 851 rigs are in operation in the free world outside the U. S. and Canada. This is 10 rigs more than last summer's record total and a continuation of the upward trend begun in 1949. Total does not include rigs assigned to workovers and service wells.

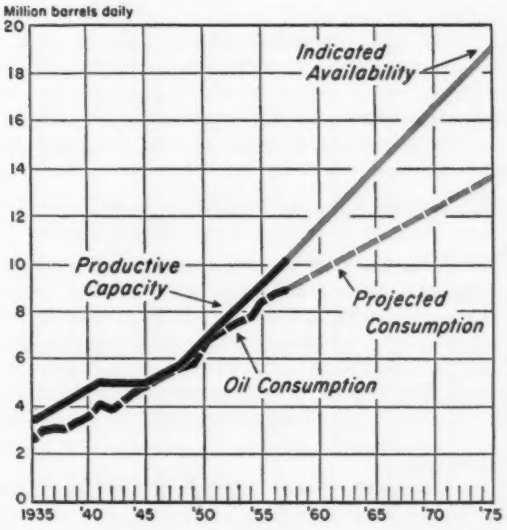
State of the Drilling Contractor. E. B. Miller, Jr. *Petrol. Eng. 30,* B-44 (1958) July (8 pp.)

Plight, problems and future of drilling contractor are discussed by four industry leaders representing 1) a drilling contractor, 2) a major operator, 3) a manufacturer-supplier and 4) an independent producer. Important question: Do we produce oil as cheaply as we know how?

Petroleum, Production

Eleventh Annual Round-Up of World Oil Activties. *Petrol. Eng. 30,* A-18 (1958) July (11 pp.)

Future Availability vs. Oil Consumption



From Two Views on the Future of Domestic Oil.
See abstract, p. 191

Progress report highlights events in 125 nations, territories and protectorates. It is a continuation of previous annual reports of oil and gas operations. Figures used are average for 1957 unless otherwise indicated.

Oil Companies Face USSR Competition. E. Adams. *Petrol. Eng. 30,* A-17 (1958) July (2 pp.)

During 1957, Soviet Union made gains in scramble for world's most useful energy. The Free World made greater progress . . . oil companies found oil, built refineries and pipelines, and supplied a record demand.

Shale Oil

Shale Oil Halt. *Business Week 1506,* 62 (1958) July 12.

Union Oil Co. of California will close down its $9-million pilot plant at the end of the month because today's oversupply of crude oil has depressed prices. Market conditions discourage gamble of $300-million on a full-scale 50,000 bbl/day oil shale plant.

Process Design

Process Evaluation from Lab to Plant. R. L. Buchanan. *Petrol. Refiner 37,* 146 (1958) June (5 pp.)

Step-by-step example of the application of process evaluation to a synthetic problem, from research laboratory through engineering to the completed plant.

Projecting the Profitability of New Products. T. T. Miller. *Chem. Eng. Progress 54,* 56 (1958) June (4 pp.)

Common sense, good judgment and the element of luck all contribute in some measure towards the evaluation of the future possible prospects of a new chemical undertaking. The evolution of the steps in marketing analysis learned by one company are presented.

What Affects Estimate Accuracy? J. W. Hackney. *Petrol. Refiner 37,* 128 (1958) June (7 pp.)

Five of the most important factors in estimate accuracy are: project definition, forecasting job conditions, estimating method used, cost records and estimator skill. Several methods of estimating with the requirements and limitations of each are discussed. These pointers and account subdivision enable cost records and estimation methods evaluation.

Exploration

Firms See Higher Fees as Solution. *Oil Gas J. 56,* 72 (1958) July 14 (2 pp.)

Geophysical contractors have been caught in web of rising costs and declining income for five years. Result: some are going out of business and others will follow unless trend is changed. One prediction states that if the current rate of attrition continues, there will be no contract geophysical industry in two years.

Research

Factors in Market Research. L. F. Marek. *Chem. Eng. News 36,* 56 (1958) July 14 (4 pp.)

Internal or external factors which market researchers overlook can be costly in expansion planning. External factors always requiring consideration are stage of business cycle and of business confidence, national population growth, population shift and mobility, anticipation of competition plays and reactions to a new product as well as technical leadership in building demand. Internal factors are planning of new capital needs and correlation to sales and profit objectives, selection of alternate projects, state of manufacturing development and inventory control.

Pipeline Research at Creole. R. W. Leach. *World Petrol. 29,* 67 (1958) July (3 pp.)

Objective of research program is the reduction of pipeline transportation costs through the development of better pipeline equipment and methods. Partner in this program with Creole Petroleum Corp. is the Standard Oil Co. (N. J.)

Patent Practice

Patent System—Roadblock to Progress? *Chem. Week 83,* 62 (1958) July 12 (3 pp.); **Are Patents Outmoded?** *Chem. Eng. News 36,* 32 (1958) July 14 (2 pp.)

Report released by Senate Subcommittee on Patents, Trademarks and Copyrights indicates that abolishment of patent system would hardly affect research expansion. Industry reaction: system has faults, but these are outweighed by benefits.

Service, Customer

What Does Management Expect from Standardization? D. E. Karn. New York: A.G.A. Operating Section Proceedings; Paper No. DMC-58-23 (1958) May.

Expectations: higher efficiency and lower cost, greater safety, better customer relations and increased profits. Belief is that standardization deprives management of nothing that it would not be better off without.

Promotion

Blue Print for a Planned Merchandising Program. N. Havens. *LP-Gas 18,* 66 (1958) July (3 pp.)

Creation of a new customer or new demands by present customers are the ways the LPG industry will expand. They can be accomplished most efficiently by operation of a merchandising program. Pointers on how to establish program include an ad budget and employment of an ad agency.

How to Sell Gas Heating. C. Abell. *Butane-Propane News 20,* 32 (1958) July (5 pp.)

General comparison of efficiencies and costs of gas and oil heating, with some attention given to electric heating.

How We Licked Our "Recession". J. Hewitt. *Gas Heat and Comfort Cooling 9,* 23 (1958) July (2 pp.)

Company president outlines program of "positive thinking" developed to overcome recession. Concentration on heating systems on new construction projects was basis of project. Program called for cooperation of salesmen and builders; principle can be applied to existing homes.

Sales Policies Provide the Track for Full-Speed Ahead Selling. M. A. Brower. *Butane-Propane News 20,* 40 (1958) July (5 pp.)

Ten basic sales policies are required by every LPG gas dealership: product, price, trade-in, financing, credit, guarantee, service, returns, leasing and competition. Article examines each policy individually.

Unit Heater Service. A. Perron. *Gas Heat and Comfort Cooling 9,* 26 (1958) July (3 pp.)

Article points out profits to be realized from the sale of unit heaters. Sales, installation and maintenance all spell profit for the dealer. Author tells dealer what to expect when he takes on unit heater service.

Refrigeration

Cooling with No Moving Parts. *Business Week 1506,* 61 (1958) July 12.

Two new appliances use a brand new design based on an old principle, the Peltier effect. No compressors, no fans—just electricity making things cooler. Key is new class of semiconductors—some can carry electricity well but insulate against heat. First appliances are expensive novelties, but principle could find many applications.

Safety

Safety Meetings Really Do Pay Off. *Oil Gas J. 56,* 68 (1958) July 7 (2 pp.)

Since 1953, when California company supervisors began the first of regular sessions, safety practices have improved so that: accident frequency has dropped 38%; severity of accidents has fallen 44%; accidental deaths have been cut from 56 a year to 18; the disabling accident frequency, in refining, has been reduced 31%, and accident rate, in pipelining, has plummeted 61%.

Education

Socony's Venezuelan Training Program. *World Petrol. 29,* 70 (1958) July (4 pp.)

Pushed by the lack of skilled personnel and the need for more Venezuelan personnel in high positions, Socony Mobil de Venezuela has undertaken a vigorous training program that extends from the oil field through universities in Venezuela and abroad.

2. ENERGY SUPPLY AND ECONOMICS

Petroleum Reserves

Two Views on the Future of Domestic Oil. *Independent Petrol. Assoc. Monthly 29,* 24 (1958) June (7 pp.)

Two organizations offer conflicting viewpoints on future supplies of domestic oil. Gulf Oil Corp. and other importers opine that resources are running low; Resources for the Future, Inc., foresees adequate long range U. S. supplies. Reasons for each belief are given in these side-by-side articles.

Reserves, Gas

Long-Term Gas Supply Outlook Good. D. Parson. *A.G.A. Monthly 40,* 21 (1958) June (6 pp.)

Author estimates that total demand for gas will increase from the 10.1 trillion CF annual figure in 1955 to 34.8 trillion CF in 2000. He states that total remaining reserves of natural gas are currently 1400 trillion CF. These reserves will be adequate to supply the increased demands of the economy for natural gas through 1990, at which time some supplementation by synthetic natural gas will be necessary.

Outlook Good for East Pakistan Gas Field. W. Sekules. *World Oil 147,* 154 (1958) July (2 pp.)

First discovery of gas in East Pakistan occurred in 1955 when Pakistan Petroleum Ltd. Sylhet 1 cratered and caught fire. Sylhet 2, drilled down-structure, was completed about one year later, confirming existence of a commercial gas deposit. Completion of Sylhet 3 provides a reserve of about 200 billion CF of recoverable gas. An 8-in. pipeline is to be built to transport the gas to industrial markets 145 miles southwest of Sylhet to Dacca.

Petroleum Production

Impact of USA Oil Restrictions on Venezuela. *World Petrol. 29,* 42 (1958) July (5 pp.)

Recent restrictions on imports of oil into the USA have reduced Venezuelan government revenue about 6% and crude production about 17%. Although the material damage is not small, the damage to USA-Venezuelan relations is of greater importance.

Pipelines, Construction

Pipeline Construction: Yesterday, Today and Tomorrow. J. W. Hall. *Petrol. Eng. 30,* D-13 (1958) July (3 pp.)

Reasons for anticipated continued growth of pipeline construction ($45 billion expenditure by 1970) are outlined. Discussion involves economic considerations (gross national product), energy supply curve, equipment improvement and technical progress.

Shale Oil

New Claims for Shale Oil Output. *Oil Gas J. 56,* 63 (1958) July 14.

University of Denver's Research Institute has issued a set of claims for the "Aspeco" method of processing oil-shale deposits: a shale oil industry is economically feasible in the U. S. right now; shale oil can be delivered to the West Coast at $1.42-$1.92/bbl, exclusive of profit, and production of as much as one million barrels daily in the period after 1970 would be quite reasonable.

Coal

The Bonus-Penalty Method and Coal Purchasing. R. M. Schahfer, F. H. Stout and G. W. Land. *Coal Utilization 12,* 23 (1958) June (5 pp.)

Method for correcting price to be paid for coal to adjust for receiving coal with poorer or better quality than guaranteed in the purchase contract. Result: constant net cost and a rational basis for evaluation of competing coals.

Some of the Variables in Fuel Economics. T. H. Duffy. *Coal-Heat 74,* 27 (1958) June (2 pp.)

Method of calculating cost of steam for comparison of competitive coals in terms of handling and maintenance costs as well as delivered coal cost.

Carbonization

The Coke-Oven Industry in Poland. A. Szpilewicz. *Coke and Gas 20,* 225 (1958) June (5 pp.)

General briefing is given of the Polish coke oven industry up to 1957. Eleven new plants were added to the nine prewar installations. New mines, washeries and separate coke oven gas and natural gas grids have been developed. Coal consumption was 13 million tons in plants and 3 million tons for gas in others.

Peak Load

Engineering and Economic Factors in Choosing a Peaking Gas Process. R. Kyle and P. W. Havenstein. New York: A.G.A. Operating Section Proceedings; Paper No. CEP-58-10 (1958) May.

Selection of a peaking gas process is a step in production planning. In study reported, seven processes of gas manufacture were selected as being representative of what is available to the industry.

Fuel Cells

Will 'Fuel Cells' Run Future Cars? *Petrol. Week 6,* 30 (1958) June 6 (2 pp.)

Directly significant to refiners is possibility of using hydrogen-containing byproduct gases from refining units to supply hydrogen for fuel cells. Cell has been improved since its first announcement by National Carbon Co. in September, 1957, to the point where it no longer requires pure hydrogen and oxygen. New models of the cell will operate on the oxygen contained in air with a voltage loss of only about 4%.

Electricity

Annual Energy Use for Electric Space Heating. R. L. Boyd. *Heating, Piping and Air Conditioning 30,* 113 (1958) July (4 pp.)

Methods of estimating annual energy needs are discussed. Conclusion is that formulas developed for combustion fuel requirements result in high estimates when applied to electrical heating, and that the reasons for this situation should be investigated, since there is need for a method which will yield estimates in agreement with experience records.

Exploration

Venezuelan Exploration High. *World Petrol. 29,* 49 (1958) July (7 pp.)

Exploration activities in Venezuela continue at a high level. Exploratory wells during 1957 were about 24% over 1956, and another substantial increase is in the offing for 1958—although most companies are keeping their plans flexible in the expectation of a generally higher level of business in the U. S. during the latter half of 1958.

Nuclear Energy

Atom Fuel Costs Must Be Cut. *Business Week 1506,* 32 (1958) July 14 (3 pp.); **Atomic Energy: No Real Threat to Oil.** *Petrol. Week 7,* 23 (1958) July 11 (2 pp.)

Competitive impact of nuclear power on oil is expected to be small, even by 1980, according to recent findings of the National Planning Association. In fact, predicts group, use of nuclear energy may even stimulate demand for oil products as a result of greater industrial activity.

Nuclear Reactors

Eight Reactor Types—A Thermodynamic Comparison. S. Baron. *Nucleonics 16,* 64 (1958) June (4 pp.)

Variations in turbine design, operating pressures, feedwater conditions and other design parameters make it difficult to compare reactor types. Study relates all types to a common basis for a comparison of efficiencies.

Shippingport Atomic Power Station, Radioactive Material Control. J. R. LaPointe and R. D. Brown. *Ind. Eng. Chem. 50,* 980 (1958) July (7 pp.)

Discussion of design of a safe system for disposal of radioactive wastes. Operation of disposal plant, considered a model for the industry, will provide data which will establish modified criteria for designing future radioactive waste disposal systems for other nuclear power plants.

Radioactivity Applications

A.G.A. Atomic and Radiation Studies. A. D. Harrison. New York: A.G.A. Operating Section Proceedings; Paper No. CEP-58-8 (1958) May.

High frequency radiation as a type of research offers potential to gas industry. It is not an effort to replace methanation catalysts with electric converters, but an attempt to accumulate a wealth of know-how on the subject and to conduct experimental test work. Results will not be available for some time.

CORRECTION

In the abstract of the article, "Borden Commission Examines Gas," which appeared on p. 130 of the May 1958 issue of *Gas Abstracts,* it was stated that "Commission's interim report contains two positive conclusions of vital importance to the Canadian industry . . ." A rereview of the article reveals that the Commission has not yet issued an interim report, and the two positive conclusions are the author's opinion of what the anticipated report will contain.

3. NATURAL GAS AND PETROLEUM PRODUCTION

Drilling

"Big Eye" Bit Successful in Soft Formations. E. McGhee. *Oil Gas J. 56,* 131 (1958) July 7 (2 pp.)

Money-saving way to deviate holes in soft formations without using whipstocks is now being used successfully both onshore and offshore along Louisiana coast. Ordinary jet bits with one jet oversized are used to wash the hole off vertical. Method eliminates many round trips and is reliable in direction.

Calculation and Design of Modern Rotary Deep-Drilling Equipment. H. Simon. *Erdöl u. Kohle 11,* 330 (1958) May (4 pp. German text.)

Author discusses increased driving power and improved structural features of rigs, pumps and other auxiliary equipment.

Trailer-Mounted Rig Scoots On, Off Drilling Site Quickly. D. H. Stormont. *Oil Gas J. 56,* 114 (1958) June 23 (3 pp.)

Brown Drilling Co.'s newest rig is designed to meet the low contract prices which have prevailed in California in recent years. It has 1500 hp available and will specialize in drilling to depths of 4000-9000 ft.

Exploration

Oil Migration in Recent Sediments. A. L. Kidwell and J. M. Hunt. *World Oil 147,* 79 (1958) July (4 pp.)

Theory of primary migration is proposed to explain an occurrence in the Pedernales region of northeastern Venezuela. Detailed geochemical studies have shown that oil is starting to accumulate in a sand trap 5000 years old.

Wyoming Oil Prospects Are Good. H. D. Thomas. *World Oil 147,* 83 (1958) July (6 pp.)

Bright oil future is presaged by new concepts in geological thinking. Belief that oil and gas accumulations could be found only on the anticlines has been disproved as new fields have been developed in other types of traps. Operators have proved that most of the productive oil sands in Wyoming are not necessarily blanket-type sands without pinchouts or permeability changes. Permeable rocks at depths below 8000 ft have been proven, and this should stimulate deeper drilling.

Fracturing

Fresh Water Fracturing Can Cut Treatment Costs. R. E. Hurst, J. T. Rollins and H. A. Stewart. *World Oil 147,* 117 (1958) July (5 pp.)

Where applicable, fresh water fracturing treatment can substantially reduce costs. Data are presented on the first 100 fresh water fracturing treatments in the Permian Basin as well as a description of how techniques operate.

Logging

Data Logger Tested in Pilot Work. J. J. Arendt and J. Savoy. *Petrol. Refiner 37,* 175 (1958) June (4 pp.)

Sohio has gained much experience in the use of automatic data loggers and claims its operation has increased accuracy, reduced data collection time and lowered operating costs. Description of a data logger used with a fixed bed catalytic pilot plant.

Formation Evaluation by Sonic Logging. W. P. Biggs. *Petrol. Eng. 30,* B-76 (1958) July (4 pp.)

New tool provides qualitative interpretation by visual inspection. Porosity determinations possible in all formations. High degree of accuracy substantiated by core analysis.

Offshore Operations

Lake Erie Play Heads for Record Year. *Petrol. Week 6,* 22 (1958) June 27 (2 pp.)

Exploration and development drilling on the Canadian side of Lake Erie may be headed for a record year. Reasons: a ready market, good prices and a high success ratio of tests.

Offshore Drilling for Onshore Prices. R. F. Bauer, A. J. Field and H. Stratton. *Oil Gas J. 56,* 68 (1958) June 30 (5 pp.)

Drilling into submerged lands from a floating vessel is now a reality. This new technique will have a profound influence on the future of offshore drilling. Originators claim that it permits offshore drilling for onshore prices.

Quick Drilling Expected Off California. *Oil Gas J. 56,* 72 (1958) July 7 (2 pp.)

Successful companies in record lease sale will use permanent-type platforms to test potentially rich areas. Lands Commission will act soon on bids but holds up on new sales. Texas-Monterey-Newmont combine pays most.

Petroleum, Properties

Measurement of Crude Oil Wetting Tendencies. H. N. Dunning and R. T. Johnson. *Petrol. Eng. 30,* B-26 (1958) July (2 pp.)

Method used by physical chemists may be applicable in determining effects of additives in wettability studies.

Petroleum Refining

Boost Heater-Oil Production. S. F. Kapff and J. C. Rhodes. *Oil Gas J. 56,* 100 (1958) June 16 (3 pp.)

Continuous flash-point recorder and simplified end-point apparatus help increase heater-oil production

during seasons of the year when there is an economic incentive to do so. They help keep distillation range of the heater oil as broad as the specifications allow and the fractionations as sharp as possible.

Recycling

Gas Repressuring Methods Prove Successful. P. R. Waddle. *World Oil 147,* 134 (1958) July (4 pp.)

Operators in the North Homer field of Louisiana expect to ultimately recover 63 million barrels of oil or 61% of the original oil in place. Over 25% of this ultimate recovery is attributed to gas repressuring and closely controlled production practices. Comprehensive field case history of this secondary recovery project.

Shell's New Gas-Conservation Plant. *World Petrol. 29,* 86 (1958) July (3 pp.)

Major gas-conservation plant is being built by Cia. Shell some 19 miles offshore in Lake Maracaibo. Plant would supply gas for reinjection into a reservoir for gas-lifting of lake wells and industrial use ashore.

Reservoir Engineering

Application of DST to Hydrodynamic Studies. H. K. van Poollen and S. J. Bateman. *World Oil 147,* 90 (1958) July (10 pp.)

Most sensitive data required for hydrodynamic studies are accurate formation fluid pressures. Drill stem test has been found to be a good method. Properly conducted and interpreted drill stem test will provide much important reservoir information concerning potential producing horizons.

Comparison between the Predicted and Actual Production History of a Condensate Reservoir. J. K. Rodgers, N. H. Harrison and S. Regier. *J. Petrol. Tech. 10,* 127 (1958) June (5 pp.)

Small, non-commercial discovery was depleted under closely controlled conditions and well fluids sampled at frequent intervals. Data on reservoir and production variables were accumulated on a fixed schedule. Laboratory reservoir study was conducted using initial well fluid samples as charging stock. Production procedures and operating conditions were held constant throughout the study wherever possible and in general paralleled the field work.

Does Bubble Formation Affect Reservoir Performance? D. R. Wieland. *World Oil 147,* 129 (1958) July (3 pp.)

Importance of bubble formation in reservoirs is that their number determines the departure from equilibrium in the reservoir and may substantially modify the relative permeability ratio of gas to oil and therefore the oil recovery in gas-drive fields. High production rates are the only known practical means to change this number.

The Effective Compressibility of Reservoir Rock and Its Effects on Permeability. A. S. McLatchie, R. A. Hemstock and J. W. Young. *J. Petrol. Tech. 10,* 49 (1958) June (3 pp.)

Results and experimental procedures are described covering a preliminary laboratory investigation of the compactness of reservoir rocks and its effect on porosity and permeability.

Estimation of Ultimate Recovery from Solution Gas-Drive Reservoirs. W. L. Wahl, L. D. Mullins and E. B. Elfrink. *J. Petrol. Tech. 10,* 132 (1958) June (7 pp.)

Nine charts for estimating ultimate oil recovery from solution gas-drive reservoirs are presented. Each chart incorporates a sample calculation to demonstrate the method of operation.

Secondary Recovery

Laboratory Evaluation of Prospective Enriched Gas-Drive Projects. D. M. Kehn, G. T. Pyndus and M. H. Gaskell. *J. Petrol. Tech. 10,* 45 (1958) June (4 pp.)

Recovery of oil by injection of gases enriched with ethane, propane or heavier components can be simulated in the laboratory by displacing the crude oil from a sand-packed tube at reservoir conditions of temperature and pressure with gases of interest. Concentrations of enriching components of the order of 40-50 mol per cent in the injection gas are required for these systems in order to effect recoveries above 80% of the oil originally in place.

Oil Recovery by In-Situ Combustion. J. S. McNiel, Jr., and J. T. Moss. *Petrol. Eng. 30,* B-29 (1958) July (7 pp.)

Discussion of basic design factors including air requirements, compressor requirements and oil recovery and production rates. Score on process to date: 7 tests concluded; 9 projects underway and 4 more in planning stages.

Rich Gas-Flood Works. *Oil Gas J. 56,* 70 (1958) July 14 (2 pp.)

Enriched gas drive recovery method shows encouraging results in its first field trial in South Texas' Seeligson field. Test is being conducted under exacting control conditions. Field pressure has been hiked about 300 psi and gas-oil ratios of the producing wells are coming down.

The Spraberry Can Be Flooded. L. F. Elkins. *Oil Gas J. 56,* 64 (1958) June 30 (4 pp.)

Atlantic Refining Co.'s Engineers envisioned a new approach to water flooding tight fractured sands such as the Spraberry. Calculations led to the conclusion that the process would work in the reservoir

and Atlantic's management backed this faith with a field pilot test in the central Driver area. Beginning in November 1952, water was injected into three wells. Need is for unitization on a large-scale basis so that flooding work can proceed.

Welding

High Frequency Induction Butt Weld Process Passes Field Test. *Gas Age 121,* 20 (1958) June 26 (2 pp.)

New induction heating process for butt welding steel in the field gives a weld in 90 sec with automatic shut-off on completion of the weld, permits on-site welding at rate of 4 or more per hour, and in-plant at rate of 10 or more welds per hour.

How to Prevent Weld Failures in Nuclear Power Piping. V. T. Malcolm and S. Low. *Heating, Piping and Air Conditioning 30,* 106 (1958) July (3 pp.)

Discussion of welding fabrication techniques for heavy walled piping, with special emphasis on different backup techniques, the necessity of proving the integrity of the root pass and the importance of heat treatment of welds.

Well Practice

First Quadruple Completion. L. A. Murphy. *Petrol. Eng. 30,* B-24 (1958) July (3 pp.)

Magnolia Petroleum Company will produce four different gas reservoirs through one well. Three parallel tubing strings and the casing-tubing annulus were used to produce four separate gas zones. Well is located in San Carlos field about 10 miles northeast of Edinburg, Texas.

New Tool for Fighting Pipe Collapse. B. P. Bayliss. *Oil Gas J. 56,* 118 (1958) June 23 (4 pp.)

Limited experience with a new type double-wall liner for oil and gas well indicates operators may have a significant new tool for combating pipe collapse and controlling sand.

Sand Exclusion in Oil and Gas Wells. G. H. Tausch and C. B. Corley, Jr. Part 1. *Petrol. Eng. 30,* B-38 (1958) June (8 pp.); Part 2. *Ibid.,* B-58 (1958) July (4 pp.)

Comprehensive treatment of bridging and consolidation techniques and modern applications of each including equipment and methods.

Selective Plugging of Underground Well Strata. J. Ramos and W. F. Hower (assigned to the Halliburton Oil Well Cementing Co.) U. S. 2,837,163 (1958) June 3.

Formations taking excessive water during flooding operations are rendered less permeable by precipitating within the formation pores a plug or filling which forms upon the reaction of two continuously dissolved reagents, one injected by central tubing to a lower strata and the other injected in the annulus of casing pipe to an upper strata so that mixing occurs in a selected horizontal zone.

4. GAS CONDITIONING AND LPG RECOVERY

Carbon Dioxide

Reduce CO_2 Content of Ethylene from 1000-3000 to Less Than 1 ppm. *Chem. Processing 21,* 59 (1958) July (3 pp.)

Molecular sieves are used in manufacture of polyethylene at a major petrochemical company. Single-stage purification process is economical, automatic and noncorrosive.

Condensate

Bibliography on Gas Conditioning—1957 Supplement. L. M. van der Pyl. New York: A.G.A. Operating Section Proceedings; Paper No. CEP-58-14 (1958) May.

Bibliography covers available information on papers and patents relating to the control of gas conditioning for 1957. It is a continuation of the bibliographies prepared and published by a previous A.G.A. subcommittee.

On-the-Job Changes Aid Operations. L. Resen. *Oil Gas J. 56,* 112 (1958) May 26 (2 pp.); **Three Ways to Boost Operations.** L. Resen. *Ibid.,* 134 (1958) June 23 (2 pp.)

Three on-the-job modifications put into effect at Goliad Corporation's Wilcox gasoline plant near Provident City, Texas, have resulted in increased dehydrating capacity, construction of a high-capacity instrument air dryer and the use of a recorder to take boilaway test readings.

Pacific Petroleums, Ltd.'s Field-Processing-Plant Complex. C. R. Hetherington. *Oil Gas J. 56,* 93 (1958) July 7 (23 pp.)

Eight-part description of the McMahon gas-scrubbing and refining plant at Taylor, B. C., located on the Peace River, 36 miles north of Dawson Creek. Scrubbing plant processes 300 MMCF daily of pipeline gas and refinery has a 3000-bbl/day capacity. Major process facilities are amine treating and solid adsorbent-type dehydration; absorption and distillation; light-ends fractionation; condensate stabilization and fractionation and hydrogen treating and catalytic reforming.

Hydrates

Chart Simplifies Dew Point and Hydrate Formation Problems. J. J. McKetta and A. H. Wehe. *Pipe Line Ind. 9,* 41 (1958) July (2 pp.)

One plot shows compilation of water content data

for natural gas covering the range of experimental conditions from atmospheric pressure up to 10,000 psia and temperatures from -50° to 300°F. Correction factors are also plotted for gravity and salinity of reservoir waters.

Hydrogen Sulfide, Removal

The Use of Activated Carbon for the Desulphurization of Water Gas. S. B. Vselyubskii and Ya. M. Shil'man. *Gasovaya Prom.*, 15 (1958) No. 5 (4 pp. Russian text.)

On the basis of laboratory tests, a method is proposed for removal of H_2S and COS from water gas by conversion of these components to non-volatile compounds on a single activated carbon followed by regeneration with water and ammonium sulfide.

J. W. Penney.

Carbon Dioxide

Process for Separating and Recovering Carbon Dioxide from Gaseous Mixtures. G. Giammarco (assigned to S.p.A. "Vetrocoke".) U. S. 2,840,450 (1958) June 24.

Absorption of carbon dioxide from gaseous mixtures by solutions of alkaline carbonates, phosphates, phenolates or by amino alcohols (to be regenerated by heating) is activated and enhanced by adding 5-10 gpl of selenious or tellurous acids, or their salts.

Hydrogen Cyanide

Process of Removing Hydrocyanic Acid, Hydrogen Sulfide and Ammonia from Gases. O. Grosskinsky, H. Fruhbuss and W. Klempt. U. S. 2,837,398 (1958) June 3.

Hydrogen cyanide is removed first from coke oven gas by a solid purification mass of ferrous sulfide (or sulfided iron oxide), then the ammonia is removed by acid scrubbing and finally the hydrogen sulfide is removed by the usual liquid or solid purification processes, the spent sulfided mass of the latter being used as fresh charge for the initial step.

Hydrogen Sulfide, Removal

Process of Removing Acidic Constituents from Gases Utilizing Screened Low Bulk Weight Lux Means. A. Karl (assigned to Koppers Company, Inc.) U. S. 2,839,356 (1958) June 17.

Improved removal of hydrogen sulfide, hydrogen sulfide and the like is obtained by increasing the permeability of the granular Lux mass packing by screening the mass directly into the purifying tank.

Separation of Acid Gases from Coal Carbonization Gases. H. A. Gollmar and W. M. Africa (assigned to Koppers Co., Inc.) U. S. 2,837,399 (1958) June 3.

By using a steam jet evacuator on the acid gases (hydrogen sulfide, hydrogen cyanide) just before these gases enter the high-vacuum pump in a hot vacuum actifying process, the polymer forming materials which would block the pump can be removed.

Separators

Separator for Oil, Gas and Water. F. L. Murdock, Sr. U. S. 2,837,213 (1958) June 3.

Separator for oil, gas and water emulsions is improved by transfer of heat from separated oil and water to incoming emulsion contained in gravity drained chambers.

Thiophene

Removing Benzene and Thiophene from Gasoline Hydrocarbons. C. van Eck (assigned to Shell Development Co.) U. S. 2,837,466 (1958) June 3.

Benzene or thiophene is removed from gasoline by contacting the latter with a 2-3% aqueous suspension of solid nickelous cyanide in ammonia solution to form separable solid complexes of cyanide-ammonia-thiophene. The cyclic compounds may be recovered from the complex by pressure distillation or by treating with strong NH_3.

5. NATURAL GAS TRANSMISSION

Automation

Automation in Gas Industry Operations. J. F. Ebdon. *Gas 34,* 45 (1958) July (6 pp.)

Natural pipeline companies are taking lead in progressing toward fully automated gas systems. Telecontrol is fairly routine on a number of long-distance transmission lines. Also in realm of reality —remotely controlled unattended compressor stations, both onshore and offshore. In the "almost" class—highly automated processing plants. Other pertinent factors discussed during symposium also included.

Complete Centralized Pipeline Control Is Possible Today. G. W. McGinley. *Oil Gas J. 56,* 89 (1958) July 14 (3 pp.)

Definite steps have been taken in recent years to centralize systems control in pipelining. During the last three years, rigorous centralized control philosophies, including provisions for ultimate automation, have been proved repeatedly in service. Hardware for such systems is available today, even in packaged form.

First Push Button Gas Pipeline Operating Successfully. S. Orlofsky. *Oil Gas J. 56,* 114 (1958) July 14 (6 pp.)

After more than five years of planning and develop-

ment, Gulf Interstate Gas Co.'s system of pipeline automation is now in service. The Stanton, Ky., station, an experimental satellite unit, was the prototype for the five fully automatic centrifugal-compressor stations.

Four Corners Pipe Line Operated by Remote Control. *Oil Gas J. 56,* 92 (1958) July 14 (5 pp.)

Four Corners pipeline is first new long line designed for complete unattended operation. Mainline pump stations, pressure-reducing stations, delivery valve stations, booster pumps and tank-filling and suction valves are designed for remote operation. Most of the feeder stations are equipped for automatic-custody-transfer operation.

Remote Control of Internal-Combustion-Engine Stations. P. R. Madden. *Oil Gas J. 56,* 97 (1958) July 14 (6 pp.)

Topeka, Kans., station of Great Lakes Pipe Line Co. which utilizes an engine of the full-diesel type is controlled from a point some 105 miles away. This station on the company's 10-in. products line from El Dorado to Kansas City is completely unattended. It matches the operating procedure of the motor-driven all-electric facilities.

Communications

Pipeline Communication Today and Tomorrow. C. L. Moon. *Oil Gas J. 56,* 103 (1958) July 14 (8 pp.)

Communication engineer is discovering an increasing variety of tools to handle transmission of intra-company written records, routine messages and actual pipeline operation for controlling pump units and data logging. Companies in general have their own private communication systems and supplement them with whatever common-carrier facilities are needed.

Compressors

Calculation of Compressor Horsepower. J. M. Campbell. *Oil Gas J. 56,* 94 (1958) June 30 (2 pp.)

Calculations may be performed using ideal gas equations or enthalpy charts. Requirements can be calculated theoretically using established thermodynamic relationships.

Combustion Air Conditioning—A Step Forward in Engine Design. W. R. Crooks. *Pipe Line Ind. 9,* 31 (1958) July (5 pp.)

Combustion air conditioning is economically justified on engines of higher specific output and low fuel consumption. Engine with cooled air has lower specific fuel consumption and 33% greater specific output than the latest type non-cooled compressor engines.

Trends in Gas Compressor Design. J. B. Taylor. *Gas J. 294,* 597 (1958) June 11 (4 pp.); *Gas World 147,* 1304 (1958) June 28 (3 pp.)

Economic considerations dictate the necessity of higher speeds, partly to minimize cost of compressor construction but more particularly to enable use of less costly and less bulky prime movers. Pre-war steam-driven compressor is probably still in operation, unchanged in design but performing at speeds 60-80% higher because of electric drives. Considerable discussion on details of improvements in reciprocating compressors.

Waste Heat Harnessed to Cool Compressor Units. *Petrol. Eng. 30,* D-32 (1958) July (2 pp.)

Three-unit station, totaling 2640 hp, was installed to provide compression needed to deliver gas through Cabeza Creek (Texas) gasoline plant and into district transmission system. Vapor-phase cooling utilizes a byproduct and increases operating efficiency.

Compressor Stations

Design to Control Compressor Pulsations. R. James. *Pipe Line Ind. 8,* 47 (1958) June (5 pp.)

Prevention of excess vibrations and surges calls for special design considerations. Design of reciprocating compressor piping can be resolved into two categories: 1) measures to prevent excessive mechanical vibration of the piping and 2) selection of the piping system which will provide the maximum compressor efficiency. Analog computers help solve many of the more complex problems.

Open Air Pump Stations Cost Less to Build, Are Cheaper to Maintain. A. L. Crichton. *Pipe Line Ind. 9,* 47 (1958) July (3 pp.)

Outdoor pump stations have proved to be safer than indoor installations where combustible mixtures of gas and air are more likely to accumulate. Modern equipment is now available which has a high degree of reliability for exposed service and minimum maintenance. Although more expensive, the added cost is more than offset by savings in cost of buildings.

TGT's New Station Solves Marsh Problems. M. A. Judah. *Pipe Line Ind. 8,* 35 (1958) June (4 pp.)

Three pancake horizontal, single stage, reciprocating compressors are driven by 150 hp synchronous motors at TGT's new station on the "Muskrat" line. Slab and machinery piers rest on hydraulic fill and piling driven 60 ft into the South Louisiana marsh land.

Fluid Flow

Unsteady-State Flow of Natural Gas in Long Pipelines. J. M. Nelson and J. E. Powers. *Oil Gas J. 56,* 86 (1958) June 30 (6 pp.)

Method for calculation of flow of gas under non-

steady conditions using a digital computer is presented. Method involves a finite-difference-type solution of the continuity equation and an incremental momentum balance. Equations used for solution and an example of the results obtained for one type of flow setup are shown.

Pipelines, Construction

Biggest Gas Line Ready by '59. *Petrol. Week 7,* 60 (1958) July 11 (2 pp.)

Construction has been started on a 55⅜-in. pipeline in the Pittsburgh area. It will handle coke-oven gas between several U.S. Steel Corp. plants. The 25-mile long system will have a capacity of 255-million CF/day and is designed for 50 psi.

High Pressure Steel Pipeline Practice. H. J. Escreet. *Gas T. 92,* 28 (1958) June (2 pp.)

Latest advances in laying, testing and protection of high pressure gas mains are discussed along with an explanation of the advantages of these methods. As an example, author uses 18-in. High Wycombe and 24-in. Romford pipelines with working pressures of 275 psig.

Large Pipeline Projects. A. C. Hartley. *Gas J. 294,* 552 (1958) June 4 (3 pp.)

Historical review of pipeline development and use, worldwide, from 1859 to the present.

New Design in Long-Span River Crossings. R. N. McManus. *Gas Age 121,* 31 (1958) June 12 (4 pp.)

Peace and Fraser river crossings in British Columbia involved use of unusual design concepts by Westcoast Transmission Gas Line. These are the only known major suspension crossings which utilize pipe exclusively in their supporting towers. Since pipelines themselves are too slender for dynamic stability, lateral prestressed wind catenaries were employed. Major variation was that the end of the wind catenaries was carried directly to the ground.

Pipeline Route Survey by Photogrammetry. M. E. Fuller. *Petrol. Eng. 30,* D-28 (1958) July (4 pp.)

New technique used by Pacific Gas Supply Company enables determination of lengths and bearings of lines without putting surveyors in the field with chain and transit to measure the relationship between points along a right-of-way.

Strain Gages Check Stress in Bridge Piping. A. G. Barkow and D. E. Clark. *Pipe Line Ind. 9,* 36 (1958) July (4 pp.)

Texas Illinois engineers installed a network of resistance type strain gages on bridge carrier piping, downcomers and approach bends on the company's dual 30-in. Mississippi River bridge to study vibration and secondary stresses. Data have been recorded for over 18 months in the three-year study.

World's Biggest Crude Line is Proposed for Canada. *Oil Gas J. 56,* 64 (1958) July 14 (2 pp.)

Borden Commission is considering plans for a $395-million, 2,019-mile, 36- and 34-in. pipline from Edmonton to Montreal to be called Independent Pipe Line Co. Line would be built in 1959-60, begin operation in 1961 with six pump stations totaling 23,000 hp and with a design throughput of 259,000 bbl/day. Ultimate throughput capacity would be achieved in 1970 with 20 stations aggregating 193,000 hp to transport 733,000 bbl/day.

Pipelines, Operation

Monitor System for Line Rupture Control. J. H. Stannard, Jr. and T. Morcott. *Gas Age 121,* 38 (1958) June 26 (5 pp.)

Topographical conditions required special defenses against line rupture on Pacific Gas & Electric Co.'s important supply artery. These included a sensing system with an unusual line alarm system incorporating many new features. These are described in article.

Pipeline Systems

Economics Draw Rails, Pipelines Closer. *Petrol. Week 6,* 44 (1958) June 27 (2 pp.)

All indications point to more railroads getting into product pipeline business. Railroad management's interest in pipelines is increasing most of all because it is trying to find a more satisfactory method of transporting the petroleum products that have been moved by tankcar. Many railroads are in excellent position to get into product pipelining because of their rights of way, which already link existing refining areas to markets.

Safety

The Mechanism of Explosions in Starting Air Lines. R. S. Ridgway. *Petrol. Refiner 37,* 171 (1958) June (4 pp.)

Operating and research experience indicates that fire resistant lubricant will help to stop explosions in starting air lines on large internal combustion engines. Other hints are also outlined.

Telemetering

The Control of a Grid Mains System. E. H. Winch. *Gas J. 294,* 683 (1958) June 25 (6 pp.); **Control of a Grid Mains System.** *Gas World 147,* 1300 (1958) June 28 (5 pp.)

Description of Cambridge Division grid control system which contained 20 separate areas of supply at the vesting date. All production stations are connected into the common grid, although for the purpose of distribution, the mains radiating to the northeast, southeast and south of Cambridge are treated as a separate system.

Welding

Modern Pipeline Field Welding and Quality Control. A. G. Barkow. *Oil Gas J. 56,* 113 (1958) June 16 (6 pp.)

Improved equipment, methods and tests controlled by rigid standards have altered pipeline welding from an art to a science. Effect has been to make pipelines more durable and dependable.

6. GAS AND LPG STORAGE

LPG

LP-Gas Will Go 'Special' Over Oceans. *Petrol. Week 7,* (1958) July 4 (2 pp.)

Esso Puerto Rico, new 32,300-ton 'combination tanker' has about twice the LPG capacity of any existing carrier. It can carry up to 78,400 bbl of LPG in combination with 156,000 bbl of bulk fuel oil, but has a cargo oil tankage of 211,000 bbl. Scheduled for completion by March 1, 1959, tanker is expected to move primarily in the Venezuela-to-New York service.

Underground Storage

NIG Makes Plans for 'Backyard' Underground Natural Gas Storage. *Gas Age 121,* 37 (1958) June 26.

Northern Illinois Gas Co. has requested the Illinois Commerce Commission for approval of plans to develop an underground gas storage field on a pilot basis near LaSalle, Ill. Seven deep wells have been drilled at the approximate 2000-acre storage to date at depths ranging to about 3500 ft.

7. MANUFACTURED GAS AND CHEMICAL PROCESSING

Acetylene

Production of Vinyl Chloride from Petroleum Hydrocarbons. K. J. Kosterhon. *Erdöl u. Kohle 11,* 312 (1958) May (6 pp. German text.)

Vinyl chloride production is reviewed with special emphasis on acetylene production methods.

Ammonia

Hydrazine Via NH_3 Today. *Chem. Eng. 14,* 120 (1958) July 14 (4 pp.)

Distillation with aniline breaking of hydrazine-water azeotrope, keys production of anhydrous hydrazine. Improved ammonia-oxidation route links two continuous-reaction processes to win hydrated and anhydrous products.

Carbon Dioxide

The Kinetics of Absorption of Carbon Dioxide into Neutral and Alkaline Solutions. P. V. Danckwerts and A. M. Kennedy. *Chem. Eng. Sci. 8,* 201 (1958) Nos. 3/4 (15 pp.)

Transient rates of absorption of carbon dioxide into water, nonreactive solutions, sodium hydroxide and alkaline buffer solutions have been measured at 25°C. The liquid was carried through the gas in the form of a thin film on a rotating drum, the time of exposure varying from 0.01-0.25 sec. The liquid was free from convection currents, so that the rates of absorption were controlled by diffusion and chemical reaction in the liquid. Experimental results are analyzed in this light and values obtained for solubilities, diffusivities and reaction-velocity constants in the various solutions.

Carbonization

Carbon Plant Gives Coal Producer Entree to Integrated Process Complex. *Chem. Eng. 65,* 54 (1958) June 30 (3 pp.)

Modern instrumentation for new electrode-grade carbon plant located in rapidly growing Ohio Valley aluminum complex raises calcining yields to an unusually high level. New plant can aim at major local markets, could kick off integrated coal processing.

Metallurgical Fuel from Victorian Brown Coal. G. L. Kennedy and D. G. Evans. *J. Inst. Fuel 31,* 242 (1958) June (7 pp.)

Summary of the present state of development of a new fuel suitable for metallurgical melting and smelting operations as well as for domestic purposes. New fuel is a lump char produced from non-coking brown coal by the high-temperature carbonization of briquettes. Lump strength of original briquette is retained in the char. It is reactive and has an ash content of 4%.

Some Experiments on the Fundamentals of Coking Properties. J. K. Brown, I. G. C. Dryden, D. H. Durevein, W. K. Joy and K. S. Pankhurst. *J. Inst. Fuel 31,* 259 (1958) June (15 pp.)

Chemical factors in the early stages of coke formation are summarized, and further experiments are described. The chloroform extraction method for isolating fusible primary pyrolysis products has been used to study the effects of preheating, preoxidation and blending. Carbonization in high vacuum at 400°C also is described.

Catalysts

Nickel and Cobalt Catalysts in the Petroleum Industry. Part 1. Surface Mechanisms with the Iron

Group. P. D. Wilmont. *Petrol. 21,* 187 (1958) June (5 pp.); **Part 2.** *Ibid.,* 225 (1958) July (5 pp.) Part 2 deals mainly with the major field of application, including hydrogenation of double bonds, partial hydrogenation, isomerisation, desulfurization and dehydrogenation.

Many articles have been published on use of catalysts in the petroleum industry which usually deal with over-all chemical reactions and process-engineering aspects. Some chemists, however, find it difficult to devote sufficient time to reading the literature on the fundamental research in this field necessary to obtain detailed and up-to-date views on the surface mechanisms involved. Article outlines briefly these aspects, with special reference to metals of the iron group.

Polymerization of Olefins by Complex Metal Catalysts. J. K. Stille. *Chem. Rev. 58,* 541 (1958) June (40 pp.)

Review of recent literature on complex metal catalysts, the polymerization conditions, the stereochemistry of the polymers, the mechanisms of the reactions, and the properties of the stereospecific polymers. Literature has been surveyed to November, 1957, and includes more important domestic and foreign patents.

The Temperature Produced by Heat of Reaction in the Interior of Porous Particles. C. D. Prater. *Chem. Eng. Sci. 8,* 284 (1958) Nos. 3/4 (3 pp.)

Derivation of an equation relating temperature difference to reactant concentration difference. Equation is shown to be independent of the kinetics of the reaction and of the particle geometry. Examples are given of the application of this equation to the *cyclo*hexane dehydrogenation and catalyst regeneration.

Coke

Future Availability of Gas-Coke in Scotland. S. Smith. *Gas T. 92,* 49 (1958) June (2 pp.)

As a consequence of the Clean Air Act, gas industry in Scotland is faced with possibility of being called upon to provide quantities of coke additional to normal production. Fortunately, gas production process as carried out in carbonizing plants and carburetted-water-gas plants is extremely flexible.

Ethylene

Continuous Oxygen-Initiated Ethylene Polymerization. F. N. Grimsby and E. R. Gilliland. *Ind. Eng. Chem. 50,* 1049 (1958) July (4 pp.)

Laboratory investigation of oxygen-initiated polymerization of ethylene in a continuous system was undertaken to obtain data which could be more readily interpreted than those derived from batch systems heretofore reported in the literature. Correlation of new experimental data led to development of equations describing the course of the reaction. Product evaluation tests showed the effects of synthesis conditions on the properties of the polymer. Results can serve as guide to making a variety of grades of polyethylene by the high pressure route.

Gasification

Gasification and Oxidation of Combustibles. J. Meunier. Paris: Masson et Cie (1958, 550 pp. French text.)

Divided into four parts, the style of this book is so adapted that the fundamental scientific basis of fuel technology is always prevalent. Part 1 develops the theory that four-fifths of usable energy is liberated by oxygen reacting on fuels. A general explanation of the available methods of liberating energy is included as well as a discussion of the primary products of reaction. Part 2 is concerned with the properties of fuels. The origin and classification of solid and liquid fuels are explained and the latest scientific work on the classification of coal is included. Part 3, a theoretical section, explains the underlying chemistry and physics of fuel process reactions. Included are descriptions of scientific methods of calculation and explanations of the value of thermal reactions and balances, applications of thermodynamics to the more effective study of reactions and processes, and of kinetics in oxidation or gasmaking reactions, and their value in process control. Part 4, technical in nature, devotes 215 pages to distinguishing common principles and to explaining the control of basic gasification reactions. Producer gas and water gas are particularly discussed, and sufficient attention is given to newer gasmaking processes, using oxygen, pressure, ash-slagging, fluidized gasification and catalysis. Separate chapters are devoted to hydrocarbon-conversion processes in which the process heat is provided externally as in the catalytic oxidation of methane by steam. Citations to 351 publications and a subject and process index also are included.

Integration of Auxiliary Processes in Complete Gasification. J. G. King. *Gas T. 92,* 25 (1958) June (2 pp.)

Complete gasification processes require new gas treatment techniques. Article examines some of the various auxiliary processes necessary, with particular attention to the removal of CO_2 from the generator gas.

Production of High Btu-Content Gas from Carbonaceous Solid Fuels. E. Gorin (assigned to Pittsburgh Consolidation Coal Co.) U. S. 2,840,462 (1958) June 24.

High Btu-content gases are produced from fluid bed chars by reacting them with steam in a gasification

zone at 1450°-1600° and concurrently with hydrogen in a hydrogenation zone at 1500°-1700°F, both zones above 30 atm pressure. Solids are transferred from second zone to first, and from first to second zone, to maintain a thermoneutral balance at above temperature levels. Gases from both zones are shift-reacted to form CO_2 and hydrogen, scrubbed to remove CO_2+H_2S, liquefied to separate methane, and residue hydrogen is recycled.

Hydrocarbons

High Energy Hydrocarbon Fuels. J. Happel and C. J. Marsel. *Chem. Eng. Progress 54,* 60 (1958) June (5 pp.)

In the past, petroleum hydrocarbons furnished the bulk of fuels for aviation. However, certain hydrocarbons of the acetylene and cyclopropane families, by virtue of their extra energy, yield fuels which have higher specific impulses and increased reactivity (resulting in smoother combustion in engines). Possible methods of producing such fuels are reviewed, and several commercial processes are reported.

Hydrogenation

Thermal Hydrogenation. Transfer of Hydrogen from Tetralin to Cracked Residua. C. S. Carlson, A. W. Langer, J. Stewart and R. M. Hill. *Ind. Eng. Chem. 50,* 1067 (1958) July (4 pp.)

Crude residua are thermally cracked in the presence of a hydrogen donor diluent, such as Tetralin, which transfers its hydrogen to the cracked residua. Tetralin is dehydrogenated to naphthalene, and the residua are converted into lower boiling products with little coke and dry gas. Naphthalene can be catalytically hydrogenated to Tetralin and recycled. Paraffin and single-ring naphthalene compounds are ineffective hydrogen transfer agents; Decalin is somewhat effective; Tetralin is much more effective under conditions investigated. Hydrogen transfer occurs in the absence of added catalyst.

Oil Gas

Advances in High Btu Oil-Gas Manufacturing in Hawaii. P. C. Joy. New York: A.G.A. Operating Section Proceedings; Paper No. CEP-58-12 (1958) May.

Experience on the production of high Btu oil-gas from asphalt shows that penetration-grade paving asphalt is a satisfactory feedstock for the production of high Btu oil-gas; modified Jones "U" two-shell low Btu oil-gas generator successfully produces high Btu oil-gas from penetration grade paving asphalt and when cracked under conventional high Btu oil-gas generator conditions, asphalt produces larger quantities of light oils and fixed gas and smaller quantities of tar than bunker oil.

Efficiency Study of the DEMAG-ONIA-GEGI Plant at the Berlin-Mariendorf Gasworks. M. Raschig and A. Hoffmann. *Gas-u. Wasserfach 99,* 552 (1958) June 6 (3 pp. German text.)

Discussion of results of a six-day efficiency test conducted on the two-unit installation producing 50,000 Nms/day.

The "ONIA-GEGI" Process for Cyclic Catalytic Cracking of Liquid Hydrocarbons. G. L. Calderwood. New York: A.G.A. Operating Section Proceedings; CEP-58-11 (1958) May.

Process is applicable to all forms of hydrocarbons, from methane to heavy fuel oil. One hundred plants using this process are now in operation or under construction, 78 of which are designed for use with liquid hydrocarbons. Paper examples application of the "ONIA-GEGI" process to the production of industrial gas from liquid hydrocarbons.

Oxygen

New England Gets Gas Plant. *Chem. Eng. News 36,* 22 (1958) June 30 (2 pp.)

Airco has put new $9 million, 75 ton-a-day oxgyen-nitrogen-argon plant on stream. Acton, Mass., plant will manufacture 55 tons of high purity oxygen, 17 tons of nitrogen and 3 tons of argon daily.

Peak Load

Peak Shaving with LPG. J. K. Dawson. *Gas 34,* 37 (1958) July (8 pp.)

LP gas produced at Chicago's Calumet and Crawford stations is used to supplement pipeline flow gas and natural gas withdrawn from the Peoples Gas System's Herscher underground storage reservoir to meet periods of peak demands. Utilization limitations permit vaporization rates of approximately 25,000 gal/hr to meet the peak shaving requirements.

Petrochemicals

These Variables Affect Oxo Reactions. I. Kirshenbaum and V. L. Hughes. *Petrol. Refiner 37,* 209 (1958) June (3 pp.)

Summary of the important process variables that affect oxo reactions. Temperature, partial pressure of the synthesis gas as well as catalyst concentration affect reaction rate, type of product and isomer distribution.

Plant Wastes

Biological Treatment of Phenolic Effluent. *Petrol. 21,* 233 (1958) July (3 pp.)

Until recently, the main pollution efforts of the refineries were directed toward removal of suspended materials such as oils and solids from waste waters, but with the need for dealing with soluble organic contaminants the oil companies began to investigate

other methods of treatment of their phenolic polluated effluents whose main sources were the phenol plant, cat cracker, sour water and treating plant wash water. Review of methods used by Canadian refineries to comply with legal requirements in this respect.

How to Cope with a Pollution Problem. *Chem. Eng. 14,* 129 (1958) July 14 (12 pp.)

Panel of eight experts tackle water pollution problems caused by the effluents of a hypothetical chemical company. Company operates a petrochemical plant making a variety of synthetic organic chemicals, plus a 100,000 bbl/day petroleum refinery. Chemical plant discharges an average of 350 gpm of effluent and the refinery 15,000 gpm into the river. Examination of problem, its implications and possible solutions.

Propane

Five Years' Experience in Supplying Small Gas Utilities with Propane Air-Gas. R. Brisou. *J. Usines a Gaz 82,* 209 (1958) May (5 pp. French text.)

Results of supplying eight small communities with propane air gas for a five-year period. Article describes equipment, distribution system, operating experience and gives results including amount of gas supplied to each of the eight utilities.

Pyrolysis

Effect of Structure on the Thermal Decomposition of Polymers. L. A. Wall and R. E. Florin. *J. Research 60,* 451 (1958) May (8 pp.)

Many recent papers on theoretical and experimental studies have been published regarding the kinetics and mechanism of the thermal decomposition of polymers. Treatment of depolymerization as a free-radical chain reaction involving the four basic steps of initiation, propagation, transfer and termination seems adequate for a fairly complete understanding of the process in a large number of cases. Rate data now available are discussed from this point of view.

Reformed Gas

Duluth Plant for Regenerative Catalytic Reforming of Liquid Hydrocarbons. K. D. Knoblock. New York: A.G.A. Operating Section Proceedings; Paper No. CEP-58-5 (1958) May.

Description of equipment installed in the Duluth gas plant, including vertical two-shell reverse flow gas generator. Regenerative cyclic catalytic reforming process was selected because of its suitability for the Duluth type of operation and operating conditions.

Shale Oil

Some Chemical Reactions of Colorado Oil Shale Kerogen. F. M. Brower and E. L. Graham. *Ind. Eng. Chem. 50,* 1059 (1958) July (2 pp.)

Chemical reactivity of oil-shale kerogen was studied to determine something about structure of kerogen. Kerogen was found to undergo chlorination, hydrobromination, nitration, sulfonation and air oxidation under mild conditions. Degree of reactivity suggests that kerogen may be made up of monomer or other units containing one double bond for each 16-22 carbon atoms.

Acetylene

Method of Manufacturing Acetylene from Hydrocarbons. S. Tsutsumi and T. Tomonari (assigned to Kurashiki Rayon Co.) U. S. 2,838,584 (1958) June 10.

Hydrocarbons are cracked in a first-stage mild temperature and pressure treatment on copper, nickel or chromium catalysts to yield gas rich in olefins. This is diluted and cracked in second stage at 300mm Hg and 1000°C over molybdenum catalyst to give high yields of acetylenes.

Production of Acetylene by Incomplete Combustion of Hydrocarbons with Oxygen, and Apparatus Therefor. E. Lehrer (assigned to Badische Anilin- & Soda-Fabrik A.G.) U. S. 2,838,585 (1958) June 10.

In an incomplete combustion process for acetylene production, premature ignition in the burner zone is counteracted by monitoring the inlet zone pressure for increase in pressure and using this increase to activate means for stopping the ignition.

Purification of Acetylene. W. C. Schreiner (assigned to M. W. Kellogg Co.) U. S. 2,838,133 (1958) June 10.

Pyrolysis product gases containing acetylene and its polymerizable homologs are purified by scrubbing with a solvent, then stripping the solvent with inert gas to remove acetylene and further stripping the bottoms in presence of water to remove polymerizable homologs.

Ammonia

Production of Ammonia Synthesis Feed Gas. W. M. Stratford (assigned to the Texas Co.) U. S. 2,838,460 (1958) June 10.

Synthesis gas for ammonia production is produced from carbonaceous fuel in separate reaction zones, one using oxygen and one using air, blending the two product gases to obtain 3:1 carbon monoxide-nitrogen ratio. This composite gas is reacted with steam to yield CO_2 and a 3:1 hydrogen-nitrogen gas.

Ethylene

Process for the Treatment of Gases Containing Ethylene. H. Gothel, H. Kolling, O. Roelen and N.

Geiser (assigned to Ruhrchemie A.G.) U.S. 2,836,-635 (1958) May 27.

Sequence of steps of pressure scrubbing with water, alkali scrubbing, hydrogenating over VIII group metal catalysts and drying by silica gel and calcium chloride is claimed for removal of acetylene and oxygen-containing impurities from ethylene gas prior to its use in cold polymerization.

Gasification

Process for Gasifying Carbonaceous Fuels. C. R. Carkeek and D. M. Strasser (assigned to the Texas Co.) U.S. 2,838,388 (1958) June 10.

In the oxygen gasification process for making carbon monoxide and hydrogen from particulate carbon, the solid carbon dust is recovered from product gases by contacting them with an aqueous solution of oxygenated hydrocarbon wetting agent and the carbon suspension is returned to the reactor feed system.

Ore Reduction

Iron and Nickel by Carbonyl Treatment. R. M. Lewis, J. W. Cookston, L. W. Coffer and F. M. Stephens, Jr. *J. Metals 10,* 419 (1958) June (6 pp.)

Several test runs were conducted with a fluidized bed reactor and auxiliary equipment for the bench-scale semicontinuous production of nickel metal and iron carbonyl. Reductive equipment was in operation for 230 hr and 140 kg of ore were reduced. Rest of the equipment was in operation for 170 hr, during which time 12 kg of reduced ore were treated. Unit operations involved in the integrated, bench-scale equipment succeeded in producing conversions and yields comparable to the best results obtained in the batch operations.

Reduction of Metal Oxides. F. B. Sellers and P. L. Paull (assigned to Texaco Development Corp.) U.S. 2,837,419 (1958) June 3.

Metallic oxides (iron ores) are reduced to metal in a shaft furnace by injecting at 2600°-2800° F a reducing gas formed by oxygen gasification of a water-coal slurry in a separate generating zone.

Reduction of Metallic Sulfide Ores. R. Lee (assigned to Lee Foundation for Nutritional Research.) U. S. 2,839,381 (1958) June 17.

Powdered sulfide ores are passed through a hydrogen atmosphere at a temperature below which the ore or metal become plastic. The hydrogen sulfide so formed is decomposed to solid sulfur and hydrogen and the latter is recycled.

Sulfur

Method and Apparatus for the Combustion of Hydrogen Sulfide and the Production of Sulfur. M. J. Hofstede (assigned to Shell Development Co.) U.S. 2,836,481 (1958) May 27.

In a combustion process for producing high purity sulfur from hydrogen sulfide containing hydrocarbon gases, carbon deposition is prevented by intensified combustion which is realized by premixing intensively 0.45-0.55 volumes oxygen per volume of H_2S which is discharged in an annular stream into a combustion chamber with an axial pilot flame for continuous ignition.

Synthesis Gas

Burner for the Production of Carbon Monoxide and Hydrogen. D. B. Eastman and L. P. Gaucher (assigned to the Texas Co.) U.S. 2,838,105 (1958) June 10.

Burner for producing carbon monoxide and hydrogen from hydrocarbon gas and oxygen comprises a central gas inlet with a surrounding annular passage for the other gas, with the edge angles of the inlet ducts so selected as to give turbulence and mixing just beyond the burner nozzle.

8. GAS DISTRIBUTION

Distribution Systems

A Rapid Method of Collecting Load Data for Low-Pressure Distribution Analysis. D. K. Kesel and J. D. Slater. *Gas Age 121,* 12 (1958) June 12 (5 pp.)

Need for a rapid method of collecting load data for analysis of low pressure distribution systems arose from expansion in building and conversion to gas heat experienced during postwar period (1946-57). McIlroy Network Analog Flow Analyzer fulfills needs for designing new construction, replacement of inadequate facilities and designing future construction for company's low pressure systems. To utilize analyzer properly, a definite need arose for collecting competent data rapidly. Method consists of three steps: 1) development of design factors; 2) accumulation of load data, and 3) application of load data.

Metering

NBS Prover Checks LP-Gas Dispenser Vs Meter Reading. *Gas Age 121,* 22 (1958) June 26 (2 pp.)

Mobile volumetric prover measures liquid volume of LPG dispensed so that a precise comparison with the meter reading can be made. Experimental and demonstration test runs in seven states and at the National Bureau of Standards have shown the effectiveness of the prototype prover.

Prover Room Operation. C. J. Sevey. New York: A.G.A. Operating Section Proceedings; Paper No. DMC-58-13 (1958) May.

Paper points out value of the various functions of the meter room and suggests some standards which will insure reliable operations and results.

Reducing Costs of Meter Maintenance by Use of the Differential Gauge. W. P. Dunphy. New York: A.G.A. Operating Section Proceedings; Paper No. DMC-58-5 (1958) May.

Laclede Gas Co. reports on its experience of using the differential gauge as a partial standard for classifying meter repairs. Number of meters falling into minor repair category resulting from the use of differential gauge for partial classifying increased, and a direct gain in production was a natural sequence. Laclede produced an annual average of 32,000 repaired meters with a repair personnel of 43 men.

Odorization

Elements of Odorization Practices. H. L. Ketcham, Jr. New York: A.G.A. Operating Section Proceedings; Paper No. CEP-58-7 (1958) May.

Type of odorization equipment selected for a particular application is dependent upon a number of factors such as maximum flow rate of gas, variation in flow rate, variation in static pressure, type of odorant used, sensitivity of the distribution system, frequency of inspection, location, availability of utilities and other factors which might be peculiar to specific installation.

Weather Forecasting

Weather Forecasting and Its Use in the Gas Industry. D. V. Buchanan. New York: A.G.A. Operating Section Proceedings; Paper No. CEP-58-2 (1958) May.

Results of a survey conducted to determine what the procedures and experiences of various gas companies across the nation were with respect to weather forecasting and its interpretation in terms of operations. Survey asked certain questions regarding the dispatch period and interpretation of weather forecasts and estimated sendouts.

Leakage

Method of Reducing Leaks in Conduits. F. B. Shaw, Jr. and E. Ungethuem. U.S. 2,837,122 (1958) June 3.

Process for reducing leaks in utility conduits is claimed, in which the conduit first is filled with a fluid suspension of resealing substance under pressure, then drained and the resealer remaining in the leak interstices or joints is then precipitated by introducing an electrolyte solution under pressure.

Mains

Pipe Line Tapping Assembly. J. B. Stephenson (assigned ten per cent to W. H. Hamblen and W. T. McNeil.) U. S. 2,840,100 (1958) June 24.

Pipeline tapping assembly is claimed for providing an improved valve for tapping or diverting gas flow, or for repairing line breaks, comprising a flanged housing, a flanged-on cutting assembly operating at right angles to pipe axis to remove a section of pipe, and a slidable valve plate assembly operating in the same plane as the cutting assembly but at 90 deg to it.

Odorization

Apparatus for the Characterization of Odors. R. W. Moncrieff (assigned to Airkem, Inc.) U.S. 2,837,912 (1958) June 10.

This odor characterization method depends on the time required for appearance of odor in each of the effluent air streams from a series of three or more tubes each containing different adsorbent materials in particle form.

Dispensing Device for Odorizing Liquefied Petroleum Gas. J. W. Wilkinson (assigned to Humphrey-Wilkinson, Inc.) U.S. 2,838,206 (1958) June 10.

Odorant dispenser for odorizing liquefied petroleum gases which comprises a cylindrical container connected into a bypass stream to be odorized. Cylinder is loaded with one or more sealed cans of odorant, which are opened by a puncturing rod, and the contents released into a downward current of liquefied gas flowing past the cans.

9. GAS FUEL UTILIZATION AND APPLIANCES

Air Conditioning

Air Leakage Due to Stack Effect in Multi-story Buildings. G. L. Smith. *Air Conditioning, Heating and Ventilating 55,* 73 (1958) July (3 pp.)

Forces that bring about stack effect in multi-story buildings are explained and suggestions presented for reducing air leakage. Stack effect makes the operations of doors difficult and interferes with the operation of dampers.

Industrial and Commercial Air Conditioning with Gas. R. H. Combs, C. R. Winkler and P. E. Chamberlain. *Am. Gas J. 185,* 18 (1958) July (4 pp.)

Round-up of industrial and commercial gas air conditioning includes discussion of what's available in gas-fueled equipment for large-scale air conditioning, advantages of gas equipment and a method for comparing costs of operation.

Air Pollution

The Air Over Louisville—Summary of a Joint Report. Special Air Pollution Study of Louisville and Jefferson County, Kentucky, 1956-1957. Public Health Service: R.A. Taft Sanitary Eng. Center, Cincinnati, Ohio.

Report discusses nature and causes of air pollution in Louisville and vicinity as revealed by an extensive study in 1956-57. Some 5200 tons of sulfur oxides and 500 tons of dust per month from combustion of local 3.4% sulfur coal appear to be the major pollutants; although industrial organics and auto exhaust were high. Complete technical details will be published in a comprehensive report.

The Air Pollution Disaster—Prevention Program of Los Angeles County. R. L. Chass, M. Pratch and A. A. Atkisson. *J. Air Pollution Control Assoc. 8,* 72 (1958) May (15 pp.)

Los Angeles County air pollution disaster prevention program requires an annual expenditure of approximately $480,000 for all purposes and involves several essential activities: air monitoring, an effective communication system, intensive public information and education efforts, continuing maintenance and development of industrial shutdown plans, and constant research efforts to improve the system and the standards of contaminant concentrations.

Determination of Trace Quantities of Hydrocarbons in the Atmosphere. E. R. Quiram and W. F. Biller. *Anal. Chem. 30,* 1166 (1958) July (6 pp.)

Accurate method for determination of hydrocarbons in the atmosphere employs a freeze-out extraction technique and mass spectrometer for quantitative identification. Water vapor, carbon dioxide and residual air interference are eliminated by absorption on Ascarite-Dehydrite column. Sensitivity is in the order of 1.0 ppm.

Eye Irritation from Solar Radiation of Organic Compounds and Nitrogen Dioxide. E. E. Harton, Jr. and C. C. Bolze. San Marino, Calif.: The Air Pollution Foundation (1958) Apr. (Report No. 23)

Report on a series of statistically designed experiments conducted on a number of olefins, paraffins, ring compounds, solvents and other organic materials, using two 2200 cu ft glass houses, solar radiation and static experiments. Both branched-chain and straight-chain olefins caused more eye irritation than paraffins, and they produced more oxidant. Olefins with internal double bonds gave more eye irritation than those with terminal bonds, but there was no effect on oxidant formation. In experiments comparing various commercial solvents, very little eye irritation was produced and no significant differences in eye irritation effects were found.

The Formation of Aerosols by Irradiation of Dilute Auto Exhaust. G. J. Doyle and N. A. Renzetti. *J. Air Pollution Control Assoc. 8,* 23 (1958) May (10 pp.)

Aerosol can be formed by irradiation of dilute auto exhaust. Within the range of concentrations studied, aerosol formation is favored by increasing the concentration of deceleration exhaust and, to a lesser extent, by increasing the concentration of oxides of nitrogen. Aerosol so formed is in the submicron size region but is of sufficient concentration and size to reduce visibility appreciably and to increase the mass concentration of aerosol.

Drying

Getting the Most from a Drying System. J. E. Greever. *Metal Progress 74,* 83 (1958) July (3 pp.)

Very low dew points (—95°F) are required for manufacture of transistor metals, annealing stainless, and sintering many powder compacts. Even a well-designed drying system will fail to produce such gas unless the purging gas used while regenerating the activated alumina silica gel is equally dry.

Dust

Evaluation of Air-Borne Particulates in Atmospheric Pollution Studies. M. Katz, H. P. Sanderson and M. B. Ferguson. *Anal. Chem. 30,* 1172 (1958) July (8 pp.)

Determination of more exact relationship between absorbance of stains on filter paper and carbon content of airborne particulates in the atmosphere under various meteorological conditions. Technique for measuring hourly variations is devised. Data, statistically analyzed, satisfy the equation, $W = aD^b$; a and b are constants which are influenced by meteorological conditions.

Flame Research

The Cyanogen-Oxygen Flame Under Pressure. J. B. Conway and A. V. Grosse. *J. Am. Chem. Soc. 80,* 2972 (1958) June 20 (5 pp.)

Technique is described for operating cyanogen-oxygen flame, which yields one of the highest flame temperatures (4850°K) obtainable by chemical means, at elevated pressures to give increased temperatures. Flashback velocities at various pressures are reported and are very sensitive to pressure changes. Generalized plot is presented for calculating theoretical adiabatic flame temperatures for various CO/N_2 ratios up to 6000°K.

Determination of Hydrogen Atoms in Rich, Flat, Premixed Flames by Reaction with Heavy Water. C. P. Fenimore and G. W. Jones. *J. Phys. Chem. 62,* 693 (1958) June (5 pp.)

Concentration of hydrogen atoms in burnt gas from flames burning on a cooled porous burner is determined by adding D_2O to the reactants and measuring the rate of formation of HD in the products. [H] can be inferred if the rate constant of the reaction is known. In a 1300° K hydrogen flame, or hydrogen plus carbon monoxide flame, [H] is about 2500 times the equilibrium concentration of H atoms in the burnt gas, $[H]_{equ}$.

Evidence for the Wrinkled Continuous Laminar Wave Concept of Turbulent Burning. J. K. Richmond, W. F. Donaldson, D. S. Burgess and J. Grumer. *Jet Propulsion 28,* 393 (1958) June (7 pp.)

Article states case for the wrinkled wave concept and places limits on the regime of its applicability. Experiments indicate that the distributed reaction zone model applies to conditions of incomplete burning within the flame brush. It is suggested that the transition from wrinkled wave to distributed reaction zone corresponds to the breakdown of full turbulent flames through the incidence of "holes". New photometric evidence is presented.

Laminar Burning Velocities of Methane-Oxygen-Diluent Gas Mixtures. S. A. Weil, E. F. Searight and R. T. Ellington. *Ind. Eng. Chem. 50,* 1101 (1958) July (4 pp.)

Prediction of burning velocities of fuel-oxygen inert mixtures from primary gas composition would be applicable in the design of gas burners. Results of the systems studied (methane-oxygen-nitrogen, methane-oxygen-helium and methane-oxygen-argon) showed that the burning velocities can be expressed as the product of three terms, dependent on the reactant concentrations, the presumably inert diluent and the adiabatic flame temperature. In such form, it is most suitable for anticipating changes in gross flame structure with variation in feed gas composition.

Some Studies of Radiating Flames in a Small Gas Turbine Type Combustion Chamber. D. J. Weeks and O. A. Saunders. *J. Inst. Fuel 31,* 247 (1958) (12 pp.)

Total radiation and absorption and spectral radiation and absorption have been measured on a small swirler type combustion chamber burning kerosene, a blended fuel and heavy "Mothball" fuel. Kerosene and blended fuels give very little luminous radiation, but heavy fuel gives considerable amount. Distribution of composition and temperature across the flame widths is very non-uniform near the burner, where a core of cold unburnt fuel exists, and this makes it necessary to exercise care in defining effective temperature, emissivity and absorptivity, and in interpreting the results of such measurement.

Furnaces

Continuous Gas-Fired Furnace Sectionalized for Batch-Type Control and Operating Economy. *Ind. Heating 25,* 1154 (1958) June (4 pp.)

New furnace design for operation on a zonal intermittent basis provides both economy and improved operating control. Furnace has an over-all length of approximately 48 ft. It comprises a continuous wire mesh belt conveyor and six 6-ft individual furnace sections between a 6-ft charge table and a 6-ft discharge table.

Processing with Continuous Heating . . . An Economic Appraisal. F. O. Hess. *Metal Progress 73,* 99 (1958) June (7 pp.)

Continuous furnace should be considered as a processing tool. Many factors in its design and operation require a realistic appraisal. For example, rating a furnace on fuel efficiency and fuel costs can be deceptive. Most continuous furnaces today are not single-purpose devices and this must be considered in their evaluation.

Heat Treating

Heat Treating Roller Bearings with Total Automation. J. Squire. *Ind. Gas 36,* 2 (1958) June (3 pp.)

Only manual operation in this system is operation of the lift truck. Better quality has resulted; control is simplified; rejects have been reduced 50%; 12 men control operation of 22 furnaces.

Heat Treatment of Aluminum. H. M. Short. *Ind. Gas 36,* 5 (1958) June (5 pp.)

Wrought aluminum products can be divided into two general classifications of alloy. One is the "common" class in which physical properties result from the cold working or strain hardening of the metal. The second classification includes those alloys of a composition which permits them to obtain their physical properties by solution heat treatment. Article describes methods and equipment used for heat treating wrought alloy products.

The Metallurgy of Tempering and Annealing in Fractional Minutes. R. K. Wuerfel. *Ind. Heating 25,* 1128 (1958) June (7 pp.)

Master curves simplify selection of tempering and annealing cycles for attaining desired metal properties. Many master curves are available. The parameter of a master curve for relating hardness is primarily a function of temperature and time. Pro-

duction needs can be met by choosing the required heat time.

Heaters, Space

New Burner: Low Cost Plus Efficiency. *Petrol. Week 7,* (1958) July 4 (2 pp.)

Hotter competition for gas heating may result from a new oil burner. Manufacturer claims that it has cut 20% from the cost of its oil burner unit. High cost of oil burning equipment is partly responsible for gas heat's steady inroads into the home heating market.

A New Method for Calculating Radiant Exchanges. B. Gebhart. *Heating, Piping and Air Conditioning 30,* 131 (1958) July (5 pp.)

Presentation of general technique along with necessary definitions and equations. Method is applied to calculation of radiant energy loss rates for a floor panel under various room surface conditions. Special characteristics of this method of analysis are emphasized next by calculating radiant energy losses of a window and by determining the temperature of the adiabatic surfaces in a room. Program of analysis and calculation is recommended which would simplify application of method to design calculations.

Oil Heat Maps Tomorrow's Strategy. *Petrol. Week 6,* 36 (1958) June 20 (2 pp.)

Oil heat men know they must come up with new developments if they are to retain their markets. Wanted: improved heating oils, low-cost burners and more efficient distribution.

Overhead Radiant Heating: The Approach to Assessment and Installation. H. Watts. *Gas J. 294,* 40 (1958) June 4 (7 pp.)

Discussion of radiant heating as a system, beginning with fundamental consideration of heating and heat losses and concluding with several methods of estimating number of heaters required for optimum results.

Industrial Heating

Hottest Torch for Industrial Use. *Business Week 1504,* 109 (1958) June 28.

Plasma torch is capable of sustaining operation up to 20,000° F and higher. Plasma is a gas heated by electricity to such high temperatures that its molecules are broken down into ionized atoms which have high energy content. The higher the arc intensity per unit of gas flow, the greater the resulting temperature of the plasma.

New Developments in Industrial Gas. R. C. LeMay. *Ind. Gas 36,* 10 (1958) June (5 pp.)

Authoritative discussion of latest progress in "new" metals, ceramics, vitreous enamel, glass, billet and slug heating, soldering and brazing, metal melting higher temperatures, and the trend toward automation.

New Horizons in Continuous Strip Heat Treatment. G. J. Langenderfer. *Ind. Heating 25,* 1168 (1958) June (7 pp.)

Advances in the control of continuous strip processing are leading to rapid production techniques for many tedious heat treatments. Types of installations and rapid heating methods are described.

LPG

Conversion to LPG Pays Off in Ready-Mix Concrete Fleets. R. D. Becker, Jr. *Butane-Propane News 20,* 89 (1958) July (4 pp.)

Ready-mix concrete industry provides attractive potential market for conversion to LPG. Thousands of trucks, mostly with two engines each, are particularly adaptable to conversion. Number of such fleets is increasing rapidly, and there is hardly a city of 5000 or more that does not have at least one ready-mix fleet.

LPG Carburetion Gains in America's Largest City. H. Hasiwar and D. Reber. *LP-Gas 18,* 44 (1958) July (4 pp.)

Despite the many obstacles (transportation and storage problems as well as cost) propane carburetion has been making consistent progress as a feature in New York industrial truck operations. There is much concern among industrial truck users to reduce inplant air pollution as well as securing longer engine life, less maintenance problems and less downtime. Article contains results of a few companies who ventured to convert their industrial trucks two years ago.

Burners

Gas Burner. D. G. Pattinson. U. S. 2,839,131 (1958) June 17.

Steady noiseless pressure flame burner is claimed using gas pressure alone, in which the threaded nipple connecting the air inlet fitting and the flame outlet fitting is provided with a coaxial inner tube to form an annular flow space for passage of cooling air into the outlet (flame) end of the burner.

Gas Burner of Multi Section Port Construction. A. C. Jackson, F. B. Jackson, and J. A. Lasater (assigned to Combustion Engineering, Inc.) U. S. 2,840,150 (1958) June 24.

Improved burner is claimed which is comprised of a plurality of individual port sections, secured together longitudinally on a transverse axis to form a burner

of desired port capacity. Each port section is formed of two aluminized sheet steel side walls of triangular shape, crimped together on two edges and separated to form the flame port on the third edge, with each wall pierced by a crimped edged circular hole to provide entrance for gas-air feed, and with shouldered edges of holes designed to fit by crimping to the abutting edges on the adjacent sections in the assembly.

Gas Burner of Multi Section Port Construction. F. B. Jackson (assigned to Combustion Engineering, Inc.) U. S. 2,840,151 (1958) June 24.

Burner claimed is similar to that of built-up port sections described in U. S. 2,840,150, except that the burner slot-forming edge of the metal wall is folded reversely to form a round-edged rim surrounding the slot.

Pulse Jet Burner System. E. Reimers (assigned to Junkers & Co. G.m.b.H.) U.S. 2,838,102 (1958) June 10.

Pulse jet burner system is claimed which comprises a pair of adjacent combustion chambers operating in opposing phases and with fuel gas being fed from a spring-loaded valve to inlets operating under the suction phase. Water jackets of the chambers may be used as a water heater.

Refrigerators, Domestic

Refrigerating Device Comprising a Gas-Refrigerator. K. Roozendaal and E. Hellingman (assigned to North American Philips Co., Inc.) U.S. 2,836,954 (1958) June 3.

In a usual cold gas refrigerating system, an auxiliary medium of low boiling point (methane, ethane, nitrogen) is used to enable simplified control of refrigeration by condensate volume or pressure regulation.

Heaters, Space

Heating and Ventilating Apparatus. W. I. E. Kamm (assigned to U.S.A. as represented by Secretary of the Air Force) U.S. 2,839,046 (1958) June 17.

Pulse-type jet combustion chamber and its exhaust tube are jacketed by a casing which forms a resonant chamber. This chamber, connected to a fresh air supply, warms the air and is tuned to the explosion cycle so as to expel this air to a space to be heated.

10. EQUIPMENT AND INSTRUMENTATION

Computers

Computer Speeds Economic Evaluations. J. F. Adams, W. L. Massey, Jr. and M. Dmytryszyn. *Chem. Eng. 65,* 99 (1958) June 30 (6 pp.)

Comprehensive scheme for preliminary screening-type economic evaluations meets two cardinal requirements: speed and reasonable accuracy. Speed is achieved on an IBM 702 EDPM. Program not only derives large amount of data from nominal amount of input, but provides it in report format on masters suitable for duplication and insertion in a report.

Growing: Seismic Data-Process Centers. *Petrol. Week 7,* 32 (1958) July 11 (3 pp.)

Computer centers, an outgrowth of the wider use of magnetic tape to record geophysical information, are springing up to analyze seismic data. Today, there are at least 50 data processing centers, 30 in the U.S. and the remainder abroad. Centers have grown because often they are more economical for operators than processing their own tapes.

How Computers Aid Economic Studies. H. E. Jones and E. W. Kjellmark, Jr. *Petrol. Refiner 37,* 151 (1958) June (13 pp.)

Computer is limited only by a program and by human assumptions. Outlined is a complete computer program for project estimating, evaluation and for studying the effect of process variables. Also included is the development of basic equations for cost estimate.

The Recruiting, Selecting and Training of Programmers. T. C. Rowan. *Datamation 4,* 16 (1958) May/June (3 pp.)

Outline of the methods followed by System Development Corporation in recruiting, selecting and training programmers. During 1957, SDC devoted more than 10,000 student weeks to instructing its own personnel to program.

Equipment Design

How Moscow Designs. *Product Eng. 29,* 26 (1958) July 14 (6 pp.)

Editor tours Moscow and gives eye-witness report and evaluation of many phases of life and industry. Article on design is a combination of three surveys of equipment and appliances: 1) the Polytechnical Museum in Moscow; 2) the USSR's largest department store, GUM, and 3) the Industrial Exhibition, huge annual summer trade fair.

Heat Exchangers

How to Save Money on Exchangers. D. Q. Kern and R. E. Seaton. *Petrol. Refiner 37,* 135 (1958) June (7 pp.)

Specifications are formulated to secure equipment which meets a particular need. Without specifications, a purchaser would be obliged to make pur-

chase analyses from among items which were not entirely comparable and which offered no standard for evaluation. Article offers some design tips to include in specifications for more exchanger, lower cost and less expensive operation.

Would a CO Boiler Pay Off in Your Plant? W. H. Alexander and R. L. Bradley. *Petrol. Eng. 30,* C-15 (1958) July (4 pp.)

Economics of a CO boiler installation in conjunction with a catalytic cracking unit are specific for a given refinery. However, the economics may be generalized sufficiently to determine range of catalytic cracking unit sizes which can pay out a CO boiler. Basic variable used in determining the size is coke burning. Charts present generalized payout curves for CO boilers as a function of a cat cracker's coke burning rate.

Pilot Plants

Full Process Control Wins Pilot-Scale Role. *Chem. Eng. 14,* 78 (1958) July 14 (2 pp.)

California research organization utilizes automatic controls to lower operating costs on long test runs. Manhours are cut by 90%, data are more accurate and results are achieved faster.

Piping

Piping System Models Aid Design Communication. G. P. Hammond. *Heating, Piping & Air Conditioning 30,* 69 (1958) July (3 pp.)

Models enable engineers and designers to develop better design through better visualization and they enable those who do not have time nor the need to understand complicated engineering drawings to contribute to the design. Modeling has proved to be one effective answer in simplifying design communication.

Pumps

New Approach to NPSH. L. T. Hendrix. *Petrol. Refiner 37,* 191 (1958) June (4 pp.)

For design purposes, new correlation described will mean adequate suction head for pump operation. Data are based on recent research by the California Natural Gasoline Association and have been checked in operation.

Sonic Pump Is Ready. *Oil Gas J. 56,* 66 (1958) July 7.

Units slated for sale by October will pump fluids with high sand and water content without plugging prevent deposition of gyp on tubing string. Added plus: no down-hole pump and no sucker rods. In recent California tests, pump lifted oil of extremely low gravity.

Valves

Automation Emergency Valves. C. S. Beard and F. D. Marton. *Instruments & Automation 31,* 1053 (1958) June (6 pp.)

Discussion of valves that close or open when unsafe emergency or abnormal operating conditions occur. These conditions include: 1) loss of power; 2) high or low pressure in the system; 3) high or low temperature in the system; 4) abnormal fuel supply or combustion conditions; 5) excess flow caused by line breaks; 6) increase in chemical activity; 7) loss of control in nuclear reactors, and 8) abnormal fluid levels in equipment.

11. MATERIALS OF CONSTRUCTION, AND CORROSION

Cathodic Protection

The Current-Voltage Relationship of Galvanic Anode Arrays in Cathodic Protection. L. J. Waldron and M. H. Peterson. *Corrosion 14,* 289t (1958) June (6 pp.)

Current output of full-scale arrays of several anode sizes in use by the U.S. Navy for the cathodic protection of ship hulls were determined. Impressed-current anodes formed from sheet steel were substituted for conventional galvanic anodes to reduce the weight and number of arrays necessary to obtain the desired information. Five anode sizes were investigated.

Design and Installation of Cathodic Protection. N. P. Peifer. New York: A.G.A. Operating Section Proceedings; Paper No. DMC-58-21 (1958) May.

Presentation of various factors to determine 1) the need for cathodic protection; 2) current required; 3) cathodic interference to other underground structures; 4) elimination of cathodic interference; 5) survey methods to learn if the cathodic protection is adequate; 6) cost of cathodic protection installations, and 7) maintenance and operating costs.

Let's Look at Rectifier Efficiencies. R. M. Wainwright. *Pipe Line Ind. 9,* 43 (1958) July (4 pp.)

Major sources of energy loss in a cathodic protection rectifier are cell losses and those losses resulting from ripple power characteristics. Efficiency calculations presented will spot potential power losses and indicate ways to obtain the most protection per power dollar.

Use of Magnesium Anodes to Protect Steel Mains. H. C. Boone. *Corrosion 14,* 307t (1958) July.

Experience of a large gas distribution company in extending the length of a tunnel which housed one of its 30-in. cast iron mains. Includes application of cathodic protection and use of magnesium rods.

Ceramics

Glass and Ceramic Fibers—They Beat the Heat. T. D. Callinan. *Product Eng. 29,* 70 (1958) July 7 (3 pp.)

Design data on three important thread-like materials with rugged properties — silica fibers, ceramic fibers and glass fibers.

Porcelain Enamels and Ceramic Coatings. R. J. Fabian. *Materials In Design Eng. 48,* 103 (1958) July (16 pp.)

Up-to-date survey for engineer and designer on major type of porcelain enamel and ceramic coatings available, their important engineering properties, principal metals that can be coated and coating selection and design factors. Article also includes a glossary of basic enamel terms.

Coatings

Automation in Pipe Coating. *Pipe Line News 30,* 51 (1958) June (2 pp.)

Semi-automatic method operation for coating and wrapping installation uses new equipment and methods of handling pipe to more than double production yet increase already rigid quality control of the finished product. Labor requirements have been reduced by almost 70% and extra pipe handling has been eliminated.

Combined Corrosion Protection and Weight Applied over the Ditch. B. Quarles. *Pipe Line News 30,* 45 (1958) June (3 pp.)

Coating methods on a marine construction project for Southern Natural Gas Company differed from practices usually associated with such projects. Anticorrosion and weight coatings were both applied in one homogenous mixture in a single operation, directly onto the pipe. Coating was applied in a portable "yard" hooked onto the stern of the lay barge in a marine version of hitchhiking.

Guide to Pipe Wrapping Techniques. M. A. Hendrickson. *Am. Gas J. 185,* 22 (1958) July (6 pp.)

Illustrated article presents standard techniques developed in the industry which, if applied, simplify taping procedure and provide maximum protection.

Plastic Coatings for Buried Pipes. W. D. Parker. *Corrosion Tech. 5,* 179 (1958) June (2 pp.)

Factors which may limit the protection given by PVC pressure-sensitive tapes are: 1) aging effects of the adhesive film; 2) presence of a helical cavity at the laps; 3) lack of adhesion; 4) changes in physical properties, and 5) effects of sulfate-reducing bacteria. Introduction of pressure-sensitive tapes for underground pipe protection is too recent for definite conclusions.

Report on Thermoplastic Coal Tar Base Linings. *Corrosion 14,* 321t (1958) July (3 pp.)

Relative resistance to various chemical environments are given for thermoplastic coal tar base linings. Media to which these linings are exposed include 11 acids, 5 alkalies, 2 oxidizing agents, 3 fats and oils, 5 gases, 7 solvents, 12 salts, as well as to sodium hypochlorite and to tap, distilled and sea water. Physical and chemical properties are listed for both hot and cold applied coatings.

Thin Film Coatings—How They Perform. N. T. Shideler and F. C. Whittier. Part 2. *Pipe Line Ind. 8,* 39 (1958) June (4 pp.)

Experience to date demonstrates usefulness of coal tar-epoxies in underground protection of pipelines. Application problems are being solved through coating and equipment revision.

Corrosion

The Behavior of Steels in Hydrogen Sulfide Environments. L. W. Vollmer. *Corrosion 14,* 324t (1958) July (5 pp.)

Spontaneous cracking of steels in deep high-pressure condensate wells producing gas containing hydrogen sulfide has been a subject for considerable investigation during recent years. Article presents 1) a definition and possible mechanisms for sulfide-stress cracking of steels; 2) methods currently being used to establish the susceptibility of steels to this phenomenon; 3) summary of significant developments from research, and 4) measures currently indicated to minimize possibilities of such failures in steel equipment.

Surface Area Relationships in Polarization and Corrosion. M. Stern. *Corrosion 14,* 329t (1958) July (4 pp.)

Polarization behavior of surfaces containing regions which exhibit different overvoltage parameters for the same reaction are described. Effect of cathode area fraction on corrosion potential and corrosion rate is considered for a corroding surface controlled by activation polarization. It is shown that the corrosion potential and corrosion rate are most sensitive to area changes when the surface is largely cathode or anode. Corrosion current reaches a maximum when the surface is equally divided into anodic and cathodic regions.

Corrosion Measurement

Accelerated Condensation Corrosion Test for Evaluating Rust Preventives. E. A. Dieman and J. W. Gaynor. *Corrosion 14,* 302t (1958) June (3 pp.)

New test developed for quality control of rust preventives features short testing time and good precision. Short testing time is obtained by accelerated condensation on steel test panels. Good precision

is obtained by close control of condensation and by use of a new panel-preparation procedure in which the panels are water-treated. Testing times are 1/20-1/50 of those obtained in JAN-H-792 humidity cabinet tests. Precision with the new test is about three times as good as with the older test.

Corrosion of Steel in Water by Varied Ratios of Dissolved Gases. J. W. Watkins and G. W. Kincheloe. *Corrosion 14,* 341t (1958) July (4 pp.)

Laboratory tests were conducted with varied ratios of free carbon dioxide to both oxygen and hydrogen sulfide, with the concentration of one gas maintained constant throughout a series of tests and the concentration of the other gas varied by increments to values approaching saturation. Corrosion rate as a function of time in the system was determined at time intervals to a maximum of 984 hours exposure. Results indicated that corrosion caused by oxygen and free carbon dioxide increased almost in direct proportion to the concentration of dissolved oxygen.

Development of the Redox Probe Field Technique. F. E. Costanzo and R. E. McVey. *Corrosion 14,* 268t (1958) June (5 pp.)

Description of a field technique developed to obtain oxidation reduction potentials of soils through use of a probe. Results of all tests with this probe indicate that redox potential can be an extremely useful tool for corrosion engineering. Instrument is rugged enough for use in the field but sensitive enough to detect even small indications of bacterial corrosion.

A Progress Report on the Redox Probe. R. E. McVey. New York: A.G.A. Operating Section Proceedings; Paper No. DMC-58-16 (1958) May.

Redox probe is like any other good indicating instrument; it must be checked periodically to reaffirm its calibration and must be used in such a manner as will tend to eliminate possible sources of error in observed data. Principle of the quinhydrone electrode is presented.

Inhibitors

Laboratory Testing of Railroad Diesel Cooling System Corrosion Inhibitors. J. I. Bregman and D. B. Boies. *Corrosion 14,* 275t (1958) June (5 pp.)

Cooling system of a railroad Diesel locomotive presents a complex corrosion problem because of the number of different metals used and the wide range of conditions encountered. These factors are discussed in relation to the development of test methods for the laboratory evaluation of corrosion inhibitors.

Metals

Joining Problems Aired. J. L. McCloud. *Metal Progress 74,* 93 (1958) July (4 pp.)

Service requirements for metal assemblies used in jet and rocket engines and in atomic applications are becoming more stringent. This has focused attention on improved methods for brazing and welding metals for high-temperature service. At a recent conference, experts got together to pool their knowledge in the joining field. Summary of papers.

Plastics

Plastic Piping Material for Anti-Corrosive Applications. *Corrosion Tech. 5,* 176 (1958) June (2 pp.)

High-purity, tough and rigid thermoplastic material is available in a comprehensive range of standard sizes as pipe, seamless ducting and solid and cored bar. It has been developed as a carefully blended and compounded form of straight and unplasticized PVX. Complete absence of platicizer and co-polymerised material results in maximum chemical resistance, impact strength and softening point, and guards against age embrittlement which could otherwise result from plasticizer extraction.

Reinforced Plastics at 3,000 to 25,000°F. M. W. Riley. *Materials in Design Eng. 47,* 100 (1958) June (5 pp.)

No material known will withstand even lower internal combustion temperatures common to rockets and missiles continuously; problem is to choose a material that will postpone structural failure for duration of service. For this purpose, certain reinforced plastics are superior to metals and in many cases ceramics; reinforced plastics pyrolize but their decomposition rate is usually slower than that of metals. Up-to-date review of present knowledge.

Tank Linings. *Business Week 1503,* 60 (1958) June 21.

Polyethylene has been enlisted in the war against corrosion, a problem that costs industry $6-billion annually. One manufacturer who specializes in the protective coating of chemical tanks has developed a commercially successful method of applying an interior lining of polyethylene to steel tanks and piping.

Refractories

Above 2,500°F, What Material to Use? L. D. Loch. *Chem. Eng. 65,* 105 (1958) June 30 (5 pp.)

Brief mention of specific high-temperature processes and concentration on special superrefractories and what can be expected of them in the way of ultimate properties.

Thermal Conductivity

Calculation of the Thermal Conductivity of Porous Media. W. Woodside. *Can. J. Phys. 36,* 815 (1958) July (9 pp.)

Problem of determining the effective thermal conductivities of porous and other composite materials from the conductivities and volume fractions of their constituents is examined. An approximate equation is derived for the case of a cubic lattice of identical spherical particles in a medium having properties different from those of the particles. This equation is applied to the calculation of the thermal conductivity of snow at different densities in the range 0.10-0.48 gm/cc.

Cathodic Protection

Hot Water Tanks and Method of Increasing the Effectiveness of Cathodic Protection of the Same. F. W. Nelson (assigned to A. O. Smith Corp.) U. S. 2,839,462 (1958) June 17.

Dissolved solids in soft water are increased to cause increase in current density in a cathodically-protected lined water tank, thereby polarizing the exposed cathodic metal areas. Further flow of water with decreased solids content and current will then maintain a polarized protective condition.

12. ANALYTICAL METHODS AND TESTS

Analytical Instruments

Design and Operation of a High Pressure Mercury Porosimeter. O. G. Ingles. *Australian J. Appl. Sci. 9,* 120 (1958) June (7 pp.)

Structural and operational problems of a mercury penetration porosimeter designed for pressures up to 50,000 psi are described. Total volume of pores with radii of the order of tens of Angstroms and greater may be accurately determined. Instrument is fully hydraulic in operation.

Good Use of Process Analyzers. D. M. Wreyford and N. Richey. *Oil Gas J. 56,* 76 (1958) June 30 (7 pp.)

Infrared, ultraviolet and gas-chromatography techniques are represented. Loss of valuable material is minimized in butylene and butadiene-recovery area. Isobutane to olefin ratio in alkylation charge is monitored.

Recording Differential Balances for Thermogravimetric Analysis. Part 1. P. L. Waters. *Coke and Gas 20,* 252 (1958) June (5 pp.)

Purpose of differential thermobalances is to register directly the rate of weight loss, thereby avoiding tedium of manual interpretation; they enable decomposition process to be more readily followed, and the curves produced are comparable with those obtained by differential thermal analysis.

Carbon

Microdetermination of Carbon and Hydrogen in Pyrophoric and Hygroscopic Organic Compounds. W. P. Pickhardt, L. W. Safranski and J. Mitchell, Jr. *Anal. Chem. 30,* 1298 (1958) July (4 pp.)

Simple, convenient technique employs polyethylene bags in the handling and weighing of microsamples of pyrophoric and hygroscopic organic compounds. Bags also protect against absorption of atmospheric oxygen during transfer of the sample to a combustion tube for the determination of carbon and hydrogen. Accuracy of the determinations is not improved.

Chromatography

Chromatographic Analysis of Gas Mixtures Containing Nitrogen, Nitrous Oxide, Carbon Monoxide and Carbon Dioxide. R. N. Smith, J. Swinehart and D. G. Lesnini. *Anal. Chem. 30,* 1217 (1958) July (2 pp.)

Mixtures are separated in a two-phase packing of silica gel divided by iodine pentoxide, and analyzed by gas chromatography. Column at elevated temperature oxidizes carbon monoxide to carbon dioxide and nitric oxide to nitrogen dioxide. Gaseous mixtures can be analyzed in ten minutes.

Practical Application of Gas Chromatography. A. F. Cascioli. New York: A.G.A. Operating Section Proceedings; Paper No. CEP-58-3 (1958) May.

Examination of field of instrumentation for chemical analysis shows that vapor fractometry, by its recording of sharp peaks for each component with little or no interference, approaches an ideal condition. Simplicity and interpretation of recordings offer potentialities for solution of a variety of chemical problems.

Testing Tubes as Detectors in Gas Chromatography. K. Grosskopf. *Erdöl u. Kohle 11,* 304 (1958) May (3 pp. German text.)

Testing tube technique adapted from air toxicity practice is described for use in chromatography. Measured quantity of gas from a calibrated bellows pump is passed through a narrow tube of adsorbing packing dyed with a specific reagent and the portion of column length decolorized is previously calibrated in terms of amount of substance sought. Propane-butane analysis is shown as an example.

Coke

Quality Control Problems at Coke Ovens. L. C. Blackburn. *Gas World 147,* 115 (1958) June 7 (6 pp.)

Paper summarizes some basic problems of sampling bulk variables and illustrates how certain phenomena may arise. Brief outline of some approaches il-

lustrates how many of the problems may be attacked and the necessary stages in installing quality control systems are described. Illustration of the application of one system to raw material control is given.

Infrared Spectroscopy

On-Stream Control with an Infrared Analyzer. L. W. Adams, L. W. Herscher and H. D. Ruhl. *Control Eng. 5,* 84 (1958) July (2 pp.)

Increasing demands for direct measurements of product composition of process streams have led to greater use of analysis instruments in the closed-loop control of operating plants. Case history of an instance in which an infrared analyzer applied to reflux ratio has, for the past four years, successfully, reliably and automatically controlled the product stream from a distillation column.

Mass Spectrometer

Aromatic Types in Heavily Cracked Gas Oil Fraction. Combined Use of Ultraviolet and Mass Spectrometry. R. J. Gordon, R. J. Moore and C. E. Mueller. *Anal. Chem. 30,* 1221 (1958) July (4 pp.)

Combined use of ultraviolet spectrophotometry and mass spectrometry at low voltage ionization levels provides a more detailed analysis of chromatographic fractions of heavy gas oil materials. Trace amounts of trinuclear and tetranuclear aromatic compounds are detected. Technique eliminates spurious peaks obtained with high-voltage conventional mass spectra.

Mass Spectrometric Analysis of High-Boiling Coal-Hydrogenation Products Using Low-Ionizing Voltage. A. G. Sharkey, Jr., G. Wood and R. A. Friedel. *Chem. & Ind. 26,* 833 (1958) June (2 pp.)

Technique depends on use of electrons of low energy to produce selective ionization. For a mixture of saturated, unsaturated and aromatic compounds, the ionizing voltage can be adjusted to 1) eliminate fragment-ions resulting in a spectrum consisting only of molecule-ions thus providing the molecular weights of the constituents, 2) produce a spectrum of molecule-ions for only the aromatic and unsaturated types and 3) give the minimum number of components present in a mixture (isomers cannot be distinguished).

Moisture

Absorption Method for Determination of Moisture Content of Gaseous Hydrocarbon Mixtures. R. P. Kirsanova, M. L. Vlodavets and S. Sh. Byk. *Gazovaya Prom.,* 44 (1958) No. 4 (4 pp. Russian text.)

Moisture content of gaseous hydrocarbon mixture is determined by passing gas sample through ethylene glycol until equilibrium is attained. Water content of ethylene glycol is then determined by analysis and from calibration charts the water content of the hydrocarbon mixture is calculated.

J. W. Penney.

Oxygen

Oxygen Analyzer. D. H. Stormont. *Oil Gas J. 56,* 129 (1958) July 7 (2 pp.)

Installed in the regenerator flue gas system, unit continuously supplies data on the efficiency of the catalyst regeneration operation through monitoring oxygen content of the flue gas.

Sulfur

Polarographic Estimation of Thiophenes and Aromatic Sulfides in Petroleum. H. V. Drushel and J. F. Miller. *Anal. Chem. 30,* 1271 (1958) July (10 pp.)

Polarographic procedure for the determination of condensed thiophenes and aromatic sulfides in crude petroleum oils is described. Sulfur compounds are oxidized to sulfones by hydrogen peroxide and reduced at the dropping mercury electrode. Good agreement between the total sulfur and the sum of the percentages of sulfur compounds determined attest to the accuracy of the method.

Water

Determination of Water Vapor in Nitrogen. Thermal Conductivity Measurement of Hydrogen Liberated from Calcium Hydride. H. W. Linde and L. B. Rogers. *Anal. Chem. 30,* 1250 (1958) July (3 pp.)

Water vapor in nitrogen is determined by reacting with calcium hydride at 235° C and measuring the liberated hydrogen by thermal conductivity. Effective range is between 200 and 2000 ppm. Alcohol vapors interfere, but in the absence of water vapor the method is applicable to determine alcohol vapors.

How to Determine the Water Content of Natural Gases. J. J. McKetta and A. H. Wehe. *World Oil 147,* 122 (1958) July (2 pp.)

Chart enables determinations at pressures to 10,000 psia and temperatures from —60° to 300°F. Correction chart also is included to account for natural gases for various gravities. Third part of the chart will enable corrections to be made for the salinity of the brine with which natural gas may have been in contact. Instructions for use are included.

An Instrument for the Measurement of the Viscosity of Steam and Compressed Water. J. Kestin and J. R. Moszynski. *Trans. A.S.M.E. 80,* 1009 (1958) July (6 pp.)

Noting the highly imperfect state of present knowledge regarding the viscosity of steam, article describes

an instrument designed for the measurement of the viscosity of steam and compressed water. The project, undertaken with the sponsorship of the ASME Steam Research Committee, aims at exploring the applicability of the method of observing small torsional oscillations of bodies of revolution to the purpose at hand.

13. BASIC SCIENCE

Adsorption

Thermodesorption of Gases from Solids. A. W. Smith and S. Aranoff. *J. Phys. Chem. 62,* 684 (1958) June (3 pp.)

Theory of desorption of gases by a linearly rising temperature is developed for first- and second-order kinetics, for desorption into a constant volume and into a volume with a leak into a vacuum.

Carbon

Chemisorption of Oxygen on Activated Charcoal and Sorption of Acids and Bases. B. R. Puri, D. D. Singh, J. Nath and L. R. Sharma. *Ind. Eng. Chem. 50,* 1071 (1958) July (4 pp.)

Treatment of activated charcoal with oxygen at temperatures varying from 100°-600° fixed an appreciable amount of oxygen, which, on desorption at 1200°, was given out as water, carbon dioxide, and carbon monoxide. Total amount of chemisorbed oxygen and that given out as carbon dioxide was maximum at 400°. Amount and nature of the chemisorbed oxygen depended on the nature of the charcoal. The base-neutralizing capacity of charcoal was almost entirely due to chemisorbed oxygen, which on degassing at high temperatures, was given out as carbon dioxide. Remainder of the oxygen was not involved in base or acid adsorption by charcoal.

Compressibility

PVT Behavior for Similar Gases. S. R. Daring, E. B. Stuart and J. Coull. *Oil Gas J. 56,* 105 (1958) June 16 (2 pp.)

Precision of Benedict-Webb-Rubin equation is not utilized in any engineering problems because of the inconvenience of its application. Modified form may be used for a group of similar gases. Compressibility chart using reduced equation is presented.

Ethylene

Cyanocarbon Chemistry. II. Spectroscopic Studies of the Molecular Complexes of Tetracyanoethylene. R. E. Merrifield and W. D. Phillips. *J. Am. Chem. Soc. 80,* 2778 (1958) June 5 (5 pp.)

Complex-formation equilibrium constants and spectroscopic data for 23 π-complexes involving tetracyanoethylene and various aromatic molecules are presented.

Cyanocarbon Chemistry. I. Preparation and Reactions of Tetracyanoethylene. T. L. Cairns et al. *J. Am. Chem. Soc. 80,* 2775 (1958) June 5 (4 pp.)

Synthesis of the first percyanoolefin, tetracyanoethylene, is described. Tetracyanoethylene (TCNE) has been found to undergo a variety of reactions, including addition, replacement and cyclization reactions, to give dyes, strong acids and heterocyclic compounds.

The Structure of Ethylene from Infrared Spectra. H. C. Allen, Jr. and E. K. Plyler. *J. Am. Chem. Soc 80,* 2673 (1958) June 5 (4 pp.)

From an analysis of the parallel band of C_2H_4 at 2988.66 cm^{-1} and the parallel band of C_2D_4 at 2201.33 cm^{-1}, the inertial constants B and C for each molecule in the ground vibrational state were determined as $B = 0.9998$. $C = 0.8294$. and $B = 0.7334$, $C = 0.5636$, respectively. From these inertial constants, the molecular parameters are deduced to be $r_{cc} = 1.337$ A, $r_{ch} = 1.086$ A, and $\angle_{hch} = 177°22'$.

Fluid Flow

Design Suggestions for Multiphase Flow in Pipelines. O. Baker, *Pipe Line News 30,* 23 (1958) June (9 pp.); **Some Design Suggestions for Multiphase Flow in Pipelines.** Part 1. *Gas Age 121,* 34 (1958) June 12 (7 pp.); Part 2. *Ibid.,* 42 (1958) June 26 (4 pp.)

Development of atomic power reactors and construction of large cross-country gas transmission lines have put a major emphasis on a need for knowledge of two-phase flow. Statistics are that there are 47,000 miles of field gathering lines in the U.S. Experience of several companies indicates that about 50% of their field-gathering lines are operating as two-phase. In author's opinion solution to two-phase flow problem is one of organization not research. In recent years, real need is for correlation of data.

Heat Transfer

New, Fast, Accurate Method to Find Tubeside Heat Transfer Coefficient. N. H. Chen. *Chem. Eng. 65,* 110 (1958) June 30 (3 pp.)

Trio of charts give heat transfer coefficients for petroleum fractions flowing inside tubes within 5% of the values obtained from the Sieder-Tate equation, rapidly and without extensive mathematics.

Hydrocarbons

The Electric Strength and Molecular Structure of Hydrocarbon Gases. A. E. D. Heylen and T. J. Lewis. *Can. J. Phys. 36,* 721 (1958) June (19 pp.)

Precise measurements of the sparking potentials of a number of hydrocarbon gases over a wide range of pressure and electrode spacing are reported. Range has been extended beyond that previously reported to include *n*-paraffins up to *n*-octane and the olefins up to hexene-1. The effect of the triple

bond in acetylene and conjugation in butadiene as well as the effects of cyclization are included. Careful experimental control involving the observation of prebreakdown pulses is an important feature of the measurements, and all the gases tested were of the highest purity.

Hydrogen

Low Temperature Distillation of Hydrogen Isotepes. K. D. Timmerhaus, D. H. Weitzel and T. M. Flynn. *Chem. Eng. Progress 54,* 35 (1958) June (12 pp.)
Description of first U.S. experimental pilot plant. Article gives details of the new column and special problems involved in insulating low-temperature columns. The equilibrium composition at the one atmosphere liquefaction temperature of 20.39°K is 99.79% para. In the absence of catalysts, liquefied normal H_2 will undergo a slow ortho-to-para conversion. Over-all efficiency is defined as the ratio between the number of theoretical plates and the number of actual plates for a given separation.

Mass Spectrometer Measurements of the Diffusion Coefficient of Hydrogen in Steel in the Temperature Range of 25°-90°C. R. C. Frank, D. E. Swets and D. L. Fry. *J. Appl. Phys. 29,* 892 (1958) June (7 pp.)
Diffusion of coefficients for hydrogen in mild steel have been measured in temperature range of 25°-90°C with a mass spectrometer to study hydrogen movement through thin steel plates. Two methods of measuring diffusion were used and two sets of diffusion coefficients were obtained by these methods. First method gave coefficients which agree with values obtained by others at higher temperatures while second method, which was more reproducible, gave values considerably lower. Results are compared with those of other investigators.

Ratio of Diffusion Coefficients for the Diffusion of Hydrogen and Deuterium in Steel. R. C. Frank, R. W. Lee and R. L. Williams. *J. Appl. Phys. 29,* 898 (1958) June (3 pp.)
Ratio of diffusion coefficients for hydrogen and deuterium in steel have been measured in temperature range of 26°-86°C. Diffusion coefficients were measured simultaneously for a mixture of two gases using a mass spectrometer to observe the rate of evolution of the gases from steel.

Mass Transfer

Find Number of Theoretical Stages. J. O. Osburn. *Chem. Eng. 14,* 147 (1958) July 14 (6 pp.)
Equilibrium stage calculations presented can be applied to mass transfer during stagewise contacting in distillation and absorption, extraction and leaching.

For Mass Transfer—Quick Method Finds Optimum Trays and Reflux Ratio. J. Happel. *Chem. Eng. 14,* 144 (1958) July 14 (3 pp.)
Method deals with dollars directly. Enables determination of optimums more quickly for distillation, absorption and extraction.

How to Modify Mass Transfer Equations. J. O. Osburn. *Chem. Eng. 65,* 183 (1958) June 16 (4 pp.)
When phase composition shifts as it does in gas absorption, design calculations depend on concentration change. Therefore, when making equipment design calculations, mass transfer equations must be modified to account for these design changes. Demonstration of use of mass transfer coefficients for equipment design in which phase concentrations vary.

Methane

Intermolecular Potentials of Argon, Methane, and Ethane. A. G. DeRocco and J. O. Halford. *J. Chem. Physics 28,* 1152 (1958) June (3 pp.)
Viscosities of argon, methane and ethane are reported over a temperature range from 210°K to 475°K. In conjunction with second virial coefficient data, the viscosities have been employed to estimate the potential parameters for an Exp:6 potential. For the spherically symmetric molecules a single set of parameters served to reproduce the equilibrium and transport properties with serviceable accuracy. For ethane the procedure failed, and this failure was taken as further evidence for the fundamental inadequacy of the assumption of central forces and elastic collisions.

Nickel Carbonyl

Vibrational Spectrum of Nickel Carbonyl. L. H. Jones. *J. Chem. Physics 28,* 1215 (1958) June (5 pp.)
Infrared absorption spectrum of $Ni(CO)_4$ has been studied in the liquid and gaseous states. As a result of the observations certain frequency assignment changes have been made. Using these changes, a normal coordinate treatment was carried out.

Nuclear Energy

New Reference Nuclide. T. P. Kohman, J. H. E. Mattauch and A. H. Wapstra. *Sci. 127,* 1431 (1958) June 20 (2 pp.)
Currently three scales of atomic masses exist: 1) absolute scale, based on the gram; 2) that defined by taking the mass of one atom of the nuclide ^{16}O equal to 16 units, and 3) that taking the average atomic mass of the isotope mixture of "natural" oxygen as 16 units. Article discusses use of ^{12}C as basis for a unified scale of nuclidic masses because this definition would suit chemists and would benefit physicists.

Radioactivity Applications

Radiation Measures Fluid Flow. *Petrol. Week 6,* 46 (1958) June 20 (3 pp.)

New method of measuring flow rates with radioisotopes is expected to have wide range of applications. Equipment required to use new technique is simple.

Scale-Up of Radiation Effects. E. J. Henley, N. F. Barr, S. Thomson and E. R. Johnson. *Chem. Eng. Progress 54,* 69 (1958) June (4 pp.)

Effects of atomic radiation on chemical systems are a function of the rate and mode of energy transfer. Some important investigations have been conducted to determine the relationship between radiation effects and rate of energy transfer.

Transformation of Hydrocarbons in High Tension Fields and Analogies to Reactions Produced by Radiation. M. Freund and G. Foldiak. *Rivista dei Combustibili 12,* 291 (1958) Apr. (12 pp. Italian text.)

Report on tests conducted in processing hydrocarbons by means of high tension electrical fields. Gas stability was studied both in vacuum and at normal pressure in various gas atmospheres with liquid paraffin, an insulating oil, n-cetane and other pure hydrocarbons. Behavior to the electrical field and to radioactive radiation revealed a certain analogy.

Reactors

Chemical Kinetics and the Dynamics of Chemical Reactors. T. J. Williams. *Control Eng. 5,* 100 (1958) July (9 pp.)

Description of fundamentals governing a chemical reaction, common reaction vessels and their dynamics, and ways to achieve best combination of reactor and control system, and best ultimate yield from chemical reaction. Thus author relates chemical kinetics and reactor dynamics to automatic control.

Thermodynamics

Calculation of Virial and Joule-Thomson Coefficients at Extremely High Temperatures. E. A. Mason and J. T. Vanderslice. *Ind. Eng. Chem. 50,* 1033 (1958) July (3 pp.)

Methods are illustrated by which the equation of state and thermodynamic properties of gases can be calculated at temperatures so high that direct experimental measurements are extremely difficult, if not impossible. Methods are applicable at temperatures where the van der Waals minimum in the intermolecular potential energy curve is small compared to kT; the potential energy can therefore be treated as a pure repulsion, with possibly a small correction for the effect of intermolecular attraction.

Viscosity

Determining Viscosity of Liquefied Gaseous Hydrocarbons at Low Temperatures and High Pressures. G. W. Swift, J. A. Christy, A. A. Heckes and F. Kurata. *Chem. Eng. Progress 54,* 47 (1958) June (4 pp.)

Increasing importance of low temperature processing has created need for more reliable data concerning the effects on materials under these conditions. An apparatus to secure these data was designed. Apparatus which consists of four functional units has six unique features which set it apart from equipment previously used by other experimenters in the field.

High-Temperature Gas Viscosities. I. Nitrous Oxide and Oxygen. C. J. G. Raw and C. P. Ellis. *J. Chem. Physics 28,* 1198 (1958) June (3 pp.)

Viscosity of nitrous oxide has been measured in the temperature range of 100-1000°C. Specially constructed transpiration apparatus of fused silica was used. Results at the lower temperatures show very close agreement with those of other investigators. Viscosity results for oxygen at temperatures higher than those previously reported also are included. Molecular interaction parameters for both nitrous oxide and oxygen have been calculated in the higher temperature ranges.

Viscosity-Reduced State Correlation for Diatomic Gases. W. J. Brebach and G. Thodos. *Ind. Eng. Chem. 50,* 1095 (1958) July (6 pp.)

Reduced state-viscosity correlation, based on literature data for nitrogen, has been developed for the gaseous and liquid states. Correlation includes the effect of subatmospheric and elevated pressures over a wide temperature range.

Water

Equation of State for Water at High Pressure. I. Knopoff. *J. Chem. Physics 28,* 1067 (1958) June (3 pp.)

Equation of state for water at high pressures is derived by assuming water to be an amorphous mixture of Thomas-Fermi-Dirac oxygen atoms and Wigner-Huntington hydrogen atoms, the mixture having the correction proportion of atomic constituents. Comparison is made with more intricate models in which interaction of the fields among neighbors is assumed.

Kinetic Studies of Hydroxyl Radicals in Shock Waves. I. The Decomposition of Water between 2400° and 3200°K. S. H. Bauer, G. L. Schott and R. E. Duff. *J. Chem. Physics 28,* 1089 (1958) June (8 pp.)

Decomposition of water vapor has been studied at temperatures between 2400°-3200°K generated in plane shock waves by following changes in the concentration of OH with time. Specific radiation absorbimetry permits these measurements to be made with microsecond resolution. Measurements were made on the gas behind reflected shock waves in argon.

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Air Conditioning, Heating and Ventilating
Air Pollution Control Association, Journal of
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